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RAILWAY ART.

BY CHEMIN DE FER.

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THERE is scarcely a single department of railway management in which the true artist may not "spread himself." From the architecture and decoration of railway stations to the simple typographical perfection of railway time-tables and tickets there is room for the skillful exercise of æstheticism which I maintain is but another name for art in its broadest sense. The truth of this assertion is evident when the development of railway art during the past ten or fifteen years is considered, and a contrast is drawn between railway decoration of the present and railway unsightliness of the past. Nearly everyone can remember when railway stations even in great cities presented a mixed appearance of jails and fish-markets, and when the passenger-cars resembled animated cheese-boxes the interior of which were hideous with oil paint smeared on ceilings and sides. A handsome railway station was a thing unknown, and the beauty of passenger-cars was in inverse ratio to the amount of paint bestowed by a lavish but undiscriminating hand.

The era of tasteful railway stations has but just dawned and full daylight has scarcely yet been let in upon the subject. Without doubt there has been wonderful improvement in this direction, and railway station architecture has become a study for architects and a branch of business by itself; but there are still too many of the old structures in existence and they are being patched up to stand further wear instead of being ruthlessly torn down to make way for the progressive march of railway art. Railway station gardening has likewise come to the fore, and the wearied, dust-begrimed eye of the traveler is now gladdened at frequent intervals by the sight of stations peeping out from variegated flower beds and parterres of rich-hued leaves. Yet there are numerous stations which stand upon barren gravel and ash-heaps, casting an unwholesome gloom around the neighborhood.

Well do I remember the advent of the parlor-car and the gorgeous contrast which these vehicles offered to the dingy and grimy box which answered the purposes of ordinary travel. These wonderful new cars were then called "palace cars" and in truth their appearance did seem palatial contrasted with that of the ordinary car, and yet so marked has been the growth of art in the construction and decoration of passenger-cars that the early parlor-cars would fall immeasurably behind the new passenger-car of to-day. They, too, were but creations of paint and gilding and sadly lacked art. Car-painters have changed their tactics and fortunately for the traveling public the virtues of paint are no longer measured by the amount of it. Passenger-cars are now almost devoid of paint in their interior decorations, natural woods being substituted, while what little color is used is confined to light and graceful fresco-work and the heavy daubs of oil are no longer visible. The employment of natural woods as a finish for the interior of railway passenger-cars is commendable in more ways than one. Not only does it permit of more thorough cleaning but it never grows shabby, and every day a richer tone is imparted to the wood which if properly seasoned will outlast the framework of the car itself. The upholstery and interior fixtures of passenger-cars are also greatly improved, and down to such details as brackets and door-knobs the artist has worked wonderful changes; the old unsightly oil lamp emitting a feeble gleam and doleful odors has also disappeared and in its place has come the gas or electric burner, casting a bright light through the car. As to the exterior of passenger cars the beneficial changes have been little less marked. Dark and rich colors with simple lettering and numbering have taken the place of the gaudy coloring and scroll-work of a few years ago, and the useless and inartistic panel which in former days was always let into the sides of cars has almost disappeared.

To my eye there is nothing more perfect in artistic construction than the American locomotive as it comes from the shop. No hand can improve the art of science and one can well understand the pride of locomotive engineers in keeping their engines bright and glistening and their assiduity in oiling and polishing every inch of metal a dozen times a day. Yet even at the present time the locomotive, superb in its simplicity, is followed by a tender on which the painter has exerted his energies to render it as little as possible in keeping with the locomotive, and he even has the sacrilege to carry out his decorative theories by painting the latter as well. A day or two since I saw a locomotive of one of the trunk lines, on which the sashes of the cab-windows were painted a vivid green! It fairly gave me a turn to behold such malicious perversion of art. If there is one feature of railway decoration that is enhanced by absence and more honored in the breach than the observance it is locomotive painting. The artistic locomotive should be absolutely devoid of paint save such unobtrusive coating of the wheels and running gear as is necessary to preserve them from the effects of the atmosphere. The cab should be of plain wood in its natural state and there is even something repellant to me in painting a name and number upon a locomotive. Such designation could be effected by metal letters and figures and the symmetry of style preserved. The tender must of course be painted, but there is no reason why it should resemble a circus-wagon, and elaborate scroll-work is decidedly out of place.

I do not despise the freight-car and do not wish to pass it by when dwelling on the application of art to railway painting—even the humble coal-car deserves a few words

in this connection; but, perhaps unwittingly, these vehicles have always been better treated from an artistic standpoint than the passenger-car. Art must be appropriate and in painting the freight and coal-cars in the simplest and most durable manner the painters were true artists. For similar reasons I do not advocate the painting of sleepers nor the decoration of the rails themselves though such ornamentation would be quite as appropriate as the painting of locomotives.

The growth and development of railway art has been rapid but there is still room for further improvement in decorative methods. While the traveling public are striving for increased speed of railway trains and reduced fares, it may seem rather too exacting to urge that much attention be paid by the railways to the study and application of art, but it should be remembered in extenuation that art is one of the few attainments that are not measured by dollars and cents. As a general truth it may be stated that it is as inexpensive to decorate with taste as without it, and in fact there is apt to be a saving in the former. Art is injured far more by overwork than by underwork, and even in the building of artistic railway stations there is no more cost in constructing a building of architectural excellence than one which is unsightly and defective. Durability, and as a rule, comfort, attend art, and from an economic standpoint the cultivation of the principles of art among their employés in a decorative capacity is a wise course for railways to pursue.

A TRIP SOUTH, FORTY YEARS AGO.

BY WILLIAM S. VEST.

[Written for the AMERICAN RAILROAD JOURNAL.]

IF the thousands of tourists who, seeking for health or pleasure now every winter, exchange the ice and snow of the Northern States for the sun and water-baths of Florida had to encounter the expense, discomfort and vexatious delays always attending the devious route traveled some forty years since, it is more than likely that the land of flowers, with its fragrant orange groves, would be a *terra incognita* to most of them.

In the first decade of railroad existence in this country, all the lines south of Washington were in a rude and imperfect condition. Capital to build and equip them properly was wanting, and with their projectors, cheapness was necessarily the most important consideration. It is safe to say that not a mile of T-rail was laid on any of them. Flat bars of iron, spiked upon longitudinal wooden rails supported on "mud-sills," were in almost universal use. A high rate of speed—with safety to the trains—was not to be expected. Fifteen miles an hour, stoppages included, was about the average attained.

The engines, passenger-cars, and rolling stock generally were in perfect accord with the road-beds. The former were not heavy enough to be effective, and most of them had but two driving-wheels. A storm of sleet or slight fall of snow would cause continuous "slipping," and even a heavy white frost would sometimes cause a passenger train, when ascending a moderate grade, to come to a stand-still. The passenger-cars were most of them dirty and comfortless, and all of them devoid of water-closets, while their seats were so ingeniously contrived as to render sleep impossible. Head-lights there were none, and cow-catchers could not be used, "snake heads" being the rule and not the exception on every mile of track. Spark-catchers, so called, were in use, but so imperfectly constructed that cinders made sad havoc with the eyes and wearing apparel of the unfortunate traveler. Added to these imperfections and annoyances were the frequent changes from one road to another, and the uncertainty of making connections which, if not accomplished, detained unhappy passengers twenty-four hours, one train a day being considered amply sufficient for the limited amount of travel, and for the requirements of the post-office department. No through tickets for passage or checks for baggage could be obtained, each road being independent of every other in this respect.

We will suppose that at the time all these drawbacks to comfort existed, a resident of New York City was compelled to visit Florida on important business—there could be no other possible inducement for going. If a prudent man, he supplied himself with ample funds to meet every emergency, for no accurate estimate could be made as to the cost of the journey until it was ended. We will also suppose that he met with no accidents on the way and that he succeeded in making "schedule time," as it was called, as far as it extended—to Charleston.

Starting then from New York on a winter's morning, our Florida-bound friend could reasonably calculate, after incurring the delays in changing cars at Philadelphia, Havre de Grace and Baltimore, on reaching Washington in time to be carried in an omnibus to the steamboat running down the Potomac River to the creek of that name, some sixty miles distant. So far all had gone pleasantly enough with him; he had experienced no actual discomfort, and a good supper provided on board added to his felicity.

He probably enjoyed a very indistinct view of the venerable city of Alexandria as the steamboat glided by its deserted wharves. No doubt on hearing the tolling of its bell (a performance never omitted when opposite Mount Vernon), he rushed on deck and very likely stared hard at the little he could see of Fort Washington, on the east bank of the river, fully satisfied that he was gazing on the burial place of the great man on the Virginia side. If informed of his error, how natural it was for him to say that —as many others have said—"he was turned round somehow." Let us hope that his patriotic emotion made full atonement for his deficiency in geographical knowledge. Our friend had still time to take a nap of two or three hours before reaching Potomac Creek, and if aware of the troubles he was soon to encounter, he certainly embraced the opportunity.

Arriving at that classic landing-place, he was hurried into a stage and a few minutes convinced him, as it did thousand of others years afterward, that the "sacred soil" of Virginia was not to be invaded with impunity, at least not in that immediate vicinity. The stage-road extended to Fredericksburg, nine miles distant, and such a road! Of all well-known roads in the South, it was deemed the worst, and truly so. In rainy weather, a perfect slough of despond; at all times muddy, rough and dangerous. A Jersey "corduroy" was a macadamized turnpike when compared to it. Dickens tried his best in his American notes to do it full justice, but failed ignominiously; at least our friend thought so when, after three or four hours of

misery, jolted, bruised and fagged out, he reached Fredericksburg. Such mud he thought existed nowhere else in the world, and Burnside's army at a later period, when it made, or rather tried to make the famous "mud march" fully indorsed this opinion.

Fredericksburg is one of the non-progressive towns scattered everywhere in Virginia; it had a population of about five thousand as far back as colonial times; it has that number now and will continue to have for a century to come. To a stranger it has a very unprepossessing appearance; and its houses are sadly in want of paint. Except when discussing politics, including the "Resolutions of '98 and '99" which, by-the-way, they all know by heart, its citizens have a drowsy look. Surely they had, for two or three consecutive days and nights during the late war, noise and excitement enough to make them wide awake for a lifetime.

But our friend had no time to form any conclusions concerning the place. He was hurried on board the train about starting for Richmond; this was his first experience in riding on "hoop iron," as the flat bars were derisively styled, and it was far from pleasant. The track was rough, and the clattering of the car window-sashes rendered conversation impossible; as for sleep, that was out of the question. Four hours afterward Richmond was reached, and by omnibus, our weary and sleepy passenger boarded the train starting for Petersburg. After crossing the James River on the finest bridge existing at that time in the South, he reached that city in less than two hours. Another weary change by omnibus brought him to the Weldon and Petersburg Railroad train which received him on board. After a tedious ride of sixty-two miles, he arrived in Weldon in time to eat a bad dinner and take his seat in the train bound for Wilmington.

Weldon! what an unfortunate reputation that town on the Roanoke River has obtained among travelers; its very name is a misnomer. It was deemed so sickly in summer that whole families, unavoidably detained, have been known to keep awake all night inhaling smoke from a pine-wood fire to avoid the risk of catching the "Weldon fever." Dreary, dirty and depressing in winter, a forced detention of twenty-four hours was justly considered the acme of misery. A week spent in Sing Sing at hard labor would, to most people, be a luxury compared to a residence of the same period in this unfortunate town. It is fair to suppose that our New York friend came to this conclusion, although his stay there was but little over an hour.

The Weldon and Wilmington Railroad had been completed only a year or two before, and had been built at a cost considerably under the estimates. It was almost entirely free from curves, straight stretches for fifteen or twenty miles existing on it, and its length was one hundred and sixty miles. The schedule time to Wilmington was about eight hours, but from defective locomotive power and bad management, this time was not often made, from ten to twelve being about the average.

It is reasonable to conclude that by this time our New York friend had his fill of Southern railroads, but he had only gone half of the distance required to get rid of them. Wilmington was a long way off, and a wearisome ride was ahead of him, and although sleepy and tired, he tried to be in a good humor and to accept the inevitable. When the train left Weldon he had plenty of time to view the scenery by daylight and in his opinion there was not much to admire in it; on the contrary, it had a depressing influence. An endless succession of ghostly-looking pine trees, each of them having a ghastly scar made by the turpentine gatherer, were the most prominent features; and their dull monotony was only relieved when the train stopped at stations to take in wood and water. At every one of these stations, gaunt and hungry hogs sauntered up to the cars, and with their snouts raised the lids of the axle-boxes, and greedily devoured the tallow intended for lubricating purposes. They were all of the "razor-back" breed, a species indigenous to North Carolina. While going through Nash and Edgcome counties, the center of the turpentine country, a few of the natives would saunter on board the cars, bound for Georgia to teach the pine-wood citizens of that unenlightened State, the mysteries attending the cultivation of their own great staple. Physically, they were far from being pleasant objects to look at; clad in seedy home-spun garments, with sallow complexions, our New York friend no doubt thought them the poorest specimens of American citizens he had ever seen. Their only visible baggage were old flint-lock rifles and whiskey jugs provided with the inevitable corn-cob cork. These poor "tar-heels," as they were called, literally "left their country for their country's good." The turpentine having been exhausted on their lands, it was considered worthless. On reaching Georgia they saw good crops of cotton made on similar looking soil, and through them the Edgcome people were induced to plant a little by way of experiment. It succeeded so well, that land in that county rose in value from two to twenty-five dollars per acre, and it is now one of the largest cotton-growing counties in the State; but all this is a digression, and we return to our traveler.

After dark he saw for the first time the brilliant light furnished by the "lightwood" torches, universally in use. They lighted him in to a supper where he fancied every thing tasted of turpentine, and most likely they did, if cooked with pitch-pine, but the natives don't seem to mind the flavor.

And through the dreary hours of night the train went on, one station seeming exactly like the others all along the line; the same gloomy pine trees everywhere. About midnight the train reached Wilmington and our, by this time, utterly disgusted traveler, stumbled down the depot steps, and with a sigh of relief rushed aboard the Charleston steamboat, thanking Heaven that at last a comfortable night's sleep was at his command.

The steamers on the route from Wilmington to Charleston were not built as sea-going vessels. and in rough weather they rolled and pitched fearfully. Cases of *mal de mer* were of course very abundant. The meals served on board were poor, and the sleeping arrangements very slovenly, yet they had one great merit—they never drowned a passenger. During the ten or twelve years they were plying between the two cities, although caught occasionally in very heavy weather, no serious disaster occurred with one exception, and that was the sinking of the *North Carolina* by a steamer of the same line. No lives were lost, but several narrow escapes occurred. Dixon H. Lewis, a noted Congressman from Alabama, was on board the sinking vessel; he was a man of great weight in his own State and in fact everywhere else, for he turned the scale at 600 lbs. avoirdupois. He was rolled in his

night-clothes like a hogshead on the gangway-plank to the rescuing vessel. On reaching Charleston, the fattest citizen that could be found sent him his best suit of clothes to wear until a tailor could furnish him with garments, but it was of no use; the heavy Charlestonian proved to be but an "eagle's talon in the waist" compared to the elephantine M. C. But this is another digression, and the last.

Some time the next day after leaving Wilmington, our passenger reached Charleston, glad to call a halt in comfortable quarters, and very willing to remain in them for a day or two by way of recruiting from the fatigue and loss of sleep incurred by his tedious railroad journey, supplemented by a (probably) sea-sick voyage.

He soon found that there was no way of reaching Florida except by water; inferior steamboats ran at irregular intervals by inland route to Savannah and thence by the same mode of conveyance via Ossibaw Sound to the St. John's River, but there was no way of ascertaining how long it would take for him to reach his objective point. He might be detained in Savannah for a week, and even longer, before a passage could be obtained, and at any rate all was doubt and uncertainty.

When he did reach Florida he found it little better than a wilderness. The long and expensive Seminole war had just ended, and excepting Tallahassee, there were no towns in the State worthy of the name. Stray high-pressure boats navigated the St. John's River, but they were small, very dirty, and some of them dangerous, and boiler explosions were not infrequent. There was not a comfortable hotel in existence.

Such a state of affairs could not be pleasing to any person accustomed to civilized life, and it is to be supposed that when his business was transacted, satisfactorily or not, our friend found his way out of the State as speedily as possible. Most likely he halted at Charleston for a day or two and then, if he had gained wisdom by experience, took passage in a sailing vessel from that city and made his way home by sea.

It was intended to contrast his rough and disagreeable trip with the ease and comfort enjoyed by travelers at the present time, and to give a brief account of the many improvements everywhere made on the present overland route from New York to Florida, but to do them justice would make this article too long. Possibly I may describe them in a future number of the JOURNAL.

FIDELITY INSURANCE FROM A RAILWAY STANDPOINT.

BY JOSEPH E. RALPH.

[Written for the AMERICAN RAILROAD JOURNAL.]

IT is very generally claimed, and with much truth, that railway companies are slow to adopt new things, but to this, as to many other rules there are exceptions. Perhaps no exception is more prominent than the interest taken in the corporations for furnishing *security* for individuals holding positions of trust. The system is comparatively new and its introduction into this country is so recent that I find very few have even a faint idea of its workings; yet there are several companies already doing a fair business, more starting in, and all are looking largely to the railways for support. In the older countries where money is less easily earned, those who must rely on the honesty of subordinates are more apt to demand security; and those that must furnish "bonds" find the number that are willing to risk their savings few and far between. Under such circumstances a corporation that would furnish the needed security at a reasonable rate would be sure of patrons. Within the past few years the conditions of life in the Eastern and Atlantic States have suffered great change; the dash and confidence of America has been subdued by the conservatism of the numerous foreigners, and the institutions bred from the necessities of the latter are gaining a foot-hold.

A few years ago the elected politician, the officer of the new bank, or the recently appointed railway agent or conductor smiled at the suggestion of personal bonds. If that form was indispensable the first acquaintance was asked, and he generally signed the paper. Bonds that were so loosely drawn or executed as to be worthless were common, and the investigation of the standing of the signers was rare indeed. So many losses resulted that a reaction was natural, and the scrutiny of the security is now quite general, and the need has developed the fidelity or guarantee companies.

The railways have welcomed these corporations because they furnished the desired security without any trouble or risk. They give the railway an *ad interim* bond securing it during the time necessary for a proper investigation of the risk, and a reasonable time in which to make another appointment if the first nominee is ultimately rejected. There is security from the start without any trouble or expense for investigating, and the appointee pays the premium on his own bond. The appointed employé fills out an "application" wherein he gives an outline of his life, names those for whom he has worked, confesses to his habits, notes his assets and his liabilities, and if found satisfactory pays a certain percentage, in several installments, of the amount of security furnished for him—generally seven dollars and fifty cents per annum on a thousand dollars.

I see no reason why the railway companies should not adopt the system, but in the experience I have had, I have noted tendencies to injustice and deficiencies that must be remedied before it will become popular with the employés. In the first place many railways are naming a specific company to furnish the bonds for all their employés. This is morally wrong as pandering to the greed of the favored concern, and a very poor business policy for both the railway and the guarantee company as it is sure to engender hard feelings. Any form of security that would satisfy a court or a bank certainly is sufficient for a railway, and if the cost of personal bonds or other security had to be borne by the employés they would, except in very rare cases, soon choose the corporations. The feeling of compulsion I find the most distasteful feature among the men, and no argument will remove it.

The payment of the whole of the premium by the employé is a matter of more than seeming injustice in view of the fact that the railway is the party secured and is being saved the expense of the old system; but as it is the condition of the needed employment, it is generally more a matter of deep thought than loud words.

The naming of needlessly high security for a minimum, or for all positions, is quite too common. When an agent at a salary of about thirty dollars per month, handling but

a few hundred dollars a year and mainly held as an operator, is taxed the same for his bond premium as the agent at three times the salary, and handling ten times the cash, it is simply a case of gross injustice. The guarantee companies would be the gainers in the end if they used their influence to have more fairly proportioned security named.

The examination of the applicants is a serious matter. The thoroughness of the search is commendable, and I judge it is honestly made, but the arbitrary rejection of all applicants that show mere suspicion of wrong, or for some youthful slip that has been atoned for by years of upright life is too much like the old Jewish usages. It is void of all love for fellow man. Some cases that I have met were very unjust. We appointed a very bright man from the freight service to a position for which he proved very well fitted; he worked a revolution in the service at the point and had letters from a number of prominent men speaking well of him. After some months, when all was working smoothly, we were notified that this man was rejected. He had been discharged with a number of other passenger conductors from a road upon the finding of detectives. In his case they admitted they had no proof of dishonesty, but he had been seen several times with loose women, and was *said to gamble* occasionally. We made direct inquiries and found the general outline of the story true, but the writer spoke highly of the man, of the fact that nothing was proved against him, and hoped we would give him a chance. Another rejection was that of a very young operator who was made ticket agent—he had left some country store without proper notice, and the proprietor did not think much of him. The date would show that it was a boyish escapade, and the tone of report would indicate sound sense in leaving the employ of an ill-tempered master. I could name examples in all degrees, but it is not necessary.

The *ad interim* bond that so thoroughly secures the railway has its drawbacks also in the frequent changes necessitated by the rejections. The onus of investigating the nominee being withdrawn, men are put in for their ability to do the work, and many are afterwards rejected for past dishonesty, bad habits, etc., that their letters of reference kindly neglect to mention. If the guarantee companies break up the giving of untruthful letters of recommendation they will be welcomed as a blessing indeed.

My observations of the working of the *ad interim* bond in connection with the average letter of recommendation leads me to suggest a new field for the guarantee companies, viz.: the issuing of certificates announcing their readiness to give security for the party named within certain limits. This would enable the employing railway to know at once that the holder would not be rejected just as he became familiar with his duties, and would save the guarantee company the risk of the term of the *ad interim* bond. The record of every applicant must be investigated whether the cost be repaid by premiums subsequently received or not and once investigated the record of that man is known and available. I would suggest that for a reasonable sum—say a rate of one dollar for each thousand named—a certificate be issued to all that pass the examination, the certificate to hold good for a year from date of issue, and to be renewed for a nominal sum, and the first cost of the certificate to be allowed as part payment of the first premium due when the security is actually called for. I think this would be a popular feature with employers and with employés, and if no source of profit in itself, would at least secure patrons and save part of the present risks to the guarantee companies. Although a warm advocate of the new system, I point out its seeming deficiencies, believing it the surest way to have them removed and greater benefits accrue to all interested.

THE PROSPECTS OF YOUNG ENGINEERS.

THE world buys the services of those whom it wants and who are able to serve it; and the price is settled, like that of all commodities, by the quality and quantity of the thing bought. At the present moment, and for some time past, the supply of young men who have just served their apprenticeship is in excess of the demand. It would be mere waste of time to explain minutely why; but it is principally due to the circumstances that young men have become engineers without asking themselves whether it was likely they would be wanted. Apart altogether from the multiplicity of young men seeking employment, we have to consider what it is these young men can give in return for so many sovereigns per month. This is, unfortunately, the point to which those most interested pay least attention, and it is well that we should dwell on it even at such length that we shall have to reserve the consideration of other questions for another opportunity.

To begin with, a broad distinction must be drawn between the statical—commonly called the civil—engineer and the dynamical—commonly known as the mechanical—engineer. The former has to spend large sums of money with very little regard for the consequences. He is expected to work cheaply in the sense that he gets good value for his money, but the first consideration is that the work shall be done. The result is that a man who can take levels, make a small survey, plot a section, or run out a simple trigonometrical calculation, may be of considerable use in a civil engineer's office; always provided that he is quick, and scrupulously accurate. An inaccurate man will be very dear at any price. It follows that young civil engineers just out of their time would find little or no difficulty in getting employment if only civil engineering work was being done. As it happens, however, that in Great Britain at all events, we are not making in any quantity roads, or railways, or docks, or canals, or bridges, while there are at least fifty applicants for any possible berth, it follows that the case of the young civil engineer is nearly hopeless, and this notwithstanding that he really has professional knowledge of a useful kind, as far as it goes, to sell. The pupilage system is not a failure with him. He learns what is worth money. If he does not get employment it is not because he is ignorant, but simply because the amount of work to be done is limited in quantity, while the supply of labor is overwhelming. Nothing can improve the prospects of the young civil engineer but a large augmentation in the amount of work to be carried out, or a large reduction in the supply of engineers—such as might be brought about perhaps if young men carefully eschewed the business for fifteen or twenty years.

If we turn now to the mechanical engineer, we find matters on an entirely different footing. The mechanical engineer is a manufacturer. He may make lace machines

or power looms, or steam engines, or turbines; but there is no difference between him and the cotton-spinner, or the weaver, or the pottery-maker. We know that it is the custom to put the mechanical engineer on a much higher footing than the lace-maker, let us say. He is regarded as more scientific, more professional, so to speak. Perhaps so. It is not worth while to go into this matter. The broad fact remains that he makes things which he sells, while the civil engineer does not. Now the manufacturer knows that the making of the thing sold is only part of the business of his life. He must make and sell at a profit, and no amount of engineering skill—using the words in their abstract sense—will enable him to do this. He must know how to buy everything he wants in the cheapest and sell in the dearest market, and he must know how to cut down the cost of production to the lowest possible limit. This is not peculiar to engineering. Such things cannot be learned from books; they are not taught at science classes, and the ordinary pupil never learns them at all. The mechanical engineer who employs young men estimates their worth by what they can do, and he knows that, as a rule, they can do very little. Let us consider for a moment what a man who has served his time in the shops of a good firm, passed through the drawing-office, and studied science, can give in exchange for a salary. He is an indifferent fitter, worth, say, £1 a week; he can run a planer or a shaping machine if the work is fixed for him, as well as a boy of sixteen who has been brought up to run planers and nothing else. He can do a little at the lathe, but is not to be trusted with really accurate jobs. He is a fair draughtsman, in the sense that he can put lines neatly on paper, and can use a box of colors with some judgment. He knows a good deal about the theory of the steam-engine. He can calculate volumes of air from weights, pressures, and temperatures. He can tell one end of an indicator diagram from another. He has more than a smattering of algebra, and the first six books of Euclid are at his fingers' end. He is a fair arithmetician, and possibly knows something of electricity, magnetism, and chemistry. This is about the sum and substance of his attainments. How far are they likely to be salable? how much are they likely to fetch in the market? The list of what he does *not* know would be much more extended. We shall not attempt to reproduce it. It will suffice to point out one item. He cannot, for the life of him, tell what anything he makes or sees made, costs, or ought to cost. He is totally unable to make even an approach to an estimate. Take him into the yard in which he has worked, show him a fly-wheel, and ask him what it weighs, how much pig iron was needed to make it, what the coke that melted it measured, how long it took to turn and bore it, and it will be found that he knows none of these things. Put him in the drawing-office, give him an old engine then in the yard to rebuild, and see how he will set about it. How much of the old work will he bring in? How many new patterns will he want? Test him in any possible way connected with manufacturing for a profit, apart from abstract scientific engineering, and he will be found utterly ignorant, and being ignorant he is practically useless to the engineer outside a very narrow groove, and yet he expects to find plenty of employment at a good salary. There are pupils who are exceptions to this, and our experience goes to show that such men never want employment for any length of time. They may not be paid all they are worth, but they do not pronounce their lives a mistake. So long as they have health and strength they get work. Such are the men who get into valuable partnerships, or ultimately assume high positions. But, as we have said, they are exceptions to the general rule.

It will be found, and we say it with regret, that one reason why so many men are failures as engineers, is that they do not take salable goods to market; and this opens up a very large question indeed. The question is one of education, the consideration of which we must reserve. We must, however, before taking leave of the subject for the moment, say that enthusiasts are running the risk just now of teaching young men intended to be engineers a great deal that has no direct money value whatever. Unfortunately far too exalted an idea has been formed of the worth of so-called science to the steam-engine maker, let us say. All the science in the world would not keep him out of the bankruptcy court unless he can sell engines for more than they cost him to make. We are not deprecating the teaching of science; we only insist that, in practical mechanical engineering, science does not of necessity mean money. We often hear German and French engineers extolled for the results of their scientific training. What are the locomotives or marine engines which have resulted from it like? The Americans have been the least scientific engineers in the world; yet they have modified engine-building practice all over the world. Germany and France have been unable to compete with us without buying engines from us to copy. Science may prevent a man from making enormous mistakes; it cannot tell him how to produce even moderate commercial successes. Standing alone it is entirely helpless in commercial mechanical engineering—combined with sound practice it is useful. How and why some pupils learn the commercial part of the business, while others do not; and why some men have better chances of success than others, are points which we shall deal with at a future time. We have said nothing, however, which any employer of labor, any practical mechanical engineer, will refuse to allow. Unfortunately one of the first things the pupil discovers when out of his time, is that, according to the world in which he seeks employment, he has really learned to do nothing which is worth substantial remuneration; and all the while employers are at their wits' end to get really good and valuable men.—*The Engineer* (London).

CAN WATER BE USED AS FUEL?

CAN the hydrogen contained in water be released from the grasp of the forces which hold it in that form, and can its intense heat in combustion be economically utilized? Ever since the discovery of the properties of that element over 100 years ago this has been recognized as a problem whose successful solution would lead to economic results of incalculable importance. As its weight is more than fourteen times less than that of air, and as about one-ninth of the weight of all the water on the globe is hydrogen, it will be seen that the volume of the gas, if it should resume its separate form, would almost fill the spaces of the visible universe. The quantity is immeasurable. The heat produced by its combustion is more intense than that given out by any other form of matter. The discovery of some cheap method of unloosing this gas from the oxygen which holds it would change every lake into a coal bed

and the ocean into a reservoir of fuel sufficient for the endless generations of mankind. Whether our coal measures are inexhaustible or not would then become a question of no importance.

By subjecting steam to from 6,000 to 10,000 degrees of heat, the hydrogen and oxygen of which it is composed become separated. If steam be passed through a tube containing iron filings, heated to only 1,400 degrees, the oxygen will separate from the hydrogen and go to the iron filings, leaving the hydrogen free. If silver filings are used the heat need not exceed 1,000 degrees. These methods, however, are, of course, too expensive and too complicated for practical use.

It is claimed, however, that by the use of naptha the oxygen and hydrogen in the vapor of water can be dissociated and the hydrogen set free at small cost and in any quantity required, Many visitors to the late railway exposition will remember Dr. Holland's locomotive which stood in one of the stalls with steam kept continuously at the working pressure by means of an apparatus in which it was claimed the fire was produced by the combustion of pure or nearly pure hydrogen, and that the gas was produced from water by the use of naptha. Undoubtedly the prevalent theories are at variance with the claim that heat can be economically produced by this means, and probably many scientific men, without investigating the subject, would insist that there is no hydrogen set free from the steam used. The law of the conservation of energy is now as thoroughly established as the law of gravitation, and it is argued that, under this law, it will require as much heat to unloose the hydrogen from the water as is produced by the combustion of hydrogen with the oxygen of the air to make water—that substance being produced, as everybody knows, by such combustion. In other words the theoretical scientist says that one must use as much heat to produce his hydrogen as he can afterwards get from it, and therefore he gains nothing. To this those who believe in the naptha-water fuel reply that while to dissociate the oxygen and hydrogen in steam by heat alone may exhaust as much thermic energy as would be produced by burning the hydrogen, yet if silver filings are used only from $\frac{1}{6}$ to $\frac{1}{10}$ of the degree of heat is required to separate the two gases; and they claim still further that by the use of naptha vapor the separation is effected at a still less degree of heat. They claim that the oxygen in steam will leave the hydrogen and join itself to the carbon in the naptha vapor, setting free the hydrogen in both the steam and in the vapor of the hydro-carbon at a comparatively low temperature. In other words it is asserted that by mixing the vapors of water and of naptha at the temperature at which steam is produced, the hydrogen in both is set free ready to be used in producing the most intensely hot flame known to science. How hot it is may be judged by the fact that while one pound of alcohol has a heat-making power of 9,982,890 foot pounds, a pound of hydrogen has a calorific power of 47,888,400 foot pounds. While it is admitted that as much energy is required to separate the hydrogen and oxygen in steam as is produced by their combustion, it is claimed that a large part of this energy manifests itself in a different form from that heat —probably in the chemical process by which carbonic oxide is formed.

It will be seen that the process of producing and burning hydrogen in the furnace of a locomotive from the vapors of water and naptha is radically different from that of using naptha or petroleum as a fuel, a desideratum which many inventors have sought. Mr. Herman Haupt, the well-known engineer and railway manager, made very extensive and careful experiments with petroleum as a fuel for locomotives while connected with the Northern Pacific, and afterward published a letter relating to the subject in the *Railway Age*. Petroleum is said to be in regular use for locomotives on some Russian railways, but we have no sufficient data as to conditions and results to enable us to determine the measure of success attained. —*Railway Age.*

RAILWAY GARDENING.

"L'ALLEGRO," the well-known railway writer, has the following remarks on this subject in a recent number of the *Derbyshire* (Eng.) *Times:*

"One would scarcely think that the subject of Railway Stations was one capable of being treated in any but an utilitarian manner. Yet, on looking about me the other day at Bakewell, I became conscious of another element. The man who designed the pleasing floral and other effects on either side of the line there had taste, if not poetry in his soul.

> "No poetry in railways! foolish thought,
> Of a dull brain, to no fine music wrought.

"The name of the station and directions as to the features of the district, etc., are effectively shown by the aid of bits of spar or pebbles, and beds of flowers and plants are disposed as artistically as any to be found either in public garden or private pleasaunce. On the Midland system, so far as I know, Cheltenham and Gloucester 'bear away the bell' from an horticultural view-point. Both are old stations, and cannot in themselves be called beautiful. Yet abundance of flowers, mantling greenery formed of delicate creeping plants, and cool banks of ferns have effected a metamorphosis that is refreshing beyond measure, especially in this sultry weather. While in the 'West Countrie' I should not omit reference to Ashchurch, whose claims in this connection are considerable, as travelers by the Midland Railway Bristol-wards will readily admit. Returning to the Derby and Manchester line, stations other than Bakewell—Duffield, Belper, and Cromford to wit—are very tastefully set out. I trust the pretty practice will become more general.

"The hours of duty of railway servants are occasionally both long and monotonous. Although the time of such men may not be fully taken up by actual work, it is essential that they be on the spot. Why not then encourage them to devote their spare moments to transforming into flower-beds the frequently very unlovely surroundings of their particular stations? Stoppages at country platforms would then become less irksome to the impatient traveler, and the stations would no longer be considered as so many mile posts to be welcomed only as their decreasing number indicates the approach of the journey's end. The diversity of style and coloring in the designs, which could not fail to make itself apparent where the men were left to their own devices, would be as exciting to the curiosity as it would be pleasing to the eye, and thus the stoppage at a station would be looked upon not so much a hindrance as an opportunity for observing the different effects to be produced from the same materials according to the

varying tastes of the designers. The charming change from the rapid headlong flight of rails, posts and trees to the quiet survey of bright and many-tinted flowers and ornamental shrubberies would be as welcome an experience as could well be wished. Let us hope that if we cannot have the embankments all along the line utilized for the growing of fruits and cereals, turning them into a veritable garden of the Hesperides, as was suggested, but found impracticable, some time ago, our railway stations at any rate may be rendered more beautiful; that in the summer months at least, as Spenser quaintly hath it,—

> "No daintie flowre or herbe that grows on grownd,
> No arbarett with painted blossoms drest,
> And smelling sweete, but there it might be fownd,
> To bud out faire, and throwe her sweete smels al around.

"On the Great Western line, from say the Rossett, near Chester, nearly every station up to Paddington is enlivened and beautified by beds of flowers and ornamental rockwork. The embankments, etc., in the vicinity of many of the Scottish railway stations also are laid out in the most perfect style of horticultural art. Especially is this the case on the Caledonian Company's romantic route from Callander to Oban. Remarking this pleasing feature to the courteous representative of the railway company named when at Oban last autumn, he informed me that the principal officers of the northern section of the line subscribe to a common fund which has for its object the encouragement of this laudable practice. A holiday tour of inspection is made annually, and out of the fund prizes are awarded to those stations which in the opinion of the judges display most originality of design and effectiveness of grouping. I must, however, not omit to mention that a somewhat similar custom obtains on one or two sections of the Midland Railway, and that one of these is the Derby and Manchester line. I have dealt thus lengthily on this delightful theme, because I—and I doubt not my readers will agree with me—would have the examples I have cited followed wherever practicable."

Railroad Sanitation and Cholera.

MR. W. J. SPICER, general manager of the Chicago and Grand Trunk Railroad, has issued the following important special circular concerning sanitary inspection:

"The Secretary of the Illinois State Board of Health, in calling my attention to his recent circular addressed to the local health officers and municipal authorities regarding the importance of making thorough preparation for the possible advent of cholera, writes me as follows:

"'It is desired, as one important step in the general sanitary movement already inaugurated, that all railway stations, depots and the grounds surrounding the same be put in the best obtainable sanitary condition, with special reference to water-closets and privies; and to the character of the water supply for the use of employés and passengers. The same supervision should also be extended to passenger-cars, in the points specified. Accumulations of stagnant water, or the flow and seepage of foul drainage in the vicinity of human habitations are always injurious to health; but during a cholera epidemic they are especially dangerous. So far as such conditions obtain, as the results of embankments or road-beds, they should be remedied as speedily as possible.

"'The preservation of public health, whereby, among other things, interruption of travel and traffic may be prevented, is a matter in which common carriers and the general public have a community of both interests and duties.'

"I trust that every one will realize the importance of doing everything possible for the preservation of health. No excuse will be accepted for any want of cleanliness about station premises, yards, platforms, closets, etc. All employés having the care and supervision of property will, upon the receipt of this circular, make a thorough inspection of all buildings, outhouses, yards, grounds, etc., of this company, in respect to: 1. The condition of the water supply. 2. The disposition made of night-soil, garbage and sewerage. 3. The cleansing of yards, tracks, grounds, etc. Water is one of the commonest mediums through which cholera spreads. Hence the necessity of protecting the supply from contamination by surface drainage of filthy premises or seepage through the ground from privy-vaults and cess-pools. Night-soil, garbage, sewage and all forms of decomposing vegetable matter are highly prejudicial to health, and should be destroyed by disinfection. A frequent sprinkling of dry earth down the vaults of closets will have a good effect. Closets and urinals in passenger-cars must be kept quite clean at all times. Special attention should be given to cleaning car floors and the thorough airing of cars at the end of each trip and before further use. You will call the attention of the public authorities to all filth and unhealthful condition of property adjoining that of this company, and so situated as to affect the healthfulness of this company's premises. I am sure that all agents and all employés generally will cheerfully and vigorously coöperate in efficiently carrying out these directions."

Operations of English and American Railways.

THE method of accounting and general practice of operating adopted by American and English railways is different in many respects, yet they are so nearly parallel that a comparison of results is interesting and instructive. In the following table are found the main items of capital, earnings, expenses and general results of the railway systems of the United States and of the United Kingdom of Great Britain for the year 1883, as follows:

	United States.	United Kingdom.
Total mileage	120,552	18,681
Stocks and bonds	$7,163,100,966	$3,814,718,575
Do. per mile	59,409	204,203
Passenger earnings	206,837,256	143,412,442
Per cent. of total	25.10	41.53
Freight earnings	549,756,695	188,108,410
Per cent. of total	67.9	54.46
Miscellaneous receipts	67,178,873	13,861,779
Per cent. of total	11.0	4.01
Total receipts	823,772,924	345,382,631
Do. per mile of road operated	7,460	18,327
No. of passengers carried	312,686,641	683,718,137
No. per mile of road	2,832	36,600
Tons of freight carried	400,453,439	258,000,000
Tons per mile of road	3,635	13,800
Operating expenses	486,861,040	181,411,221
Do. per cent. of receipts	59.10	53.00
Net receipts	336,911,884	163,791,420
Per cent. on total capital	4.70	4.29

The total road operated in the United States last year included only 110,414, and the calculations of mileage results is based upon this total length of line. Notwithstanding the amount of water popularly supposed to have entered into the stock of American roads, the total capital per mile is considerably less than one-third of that of the English roads. But the roads of the United Kingdom are more substantially laid as a whole than even the best

roads of this country, and their equipment to accommodate so large a traffic per mile is much more extensive. In the cost of English roads, right of way and terminal grounds are a heavy item of expenditure, while here these items have been comparatively light. Passenger traffic upon the English roads is heavier than on those of the United States, and tonnage per mile of road operated is nearly four times as great as that upon ours. This result follows from the dense population of Great Britain, and the sparsity of people found in a large portion of territory through which our roads extend; but the net result shows that capital employed in American roads brings a better return than that invested in the railways of Great Britain.

For obvious reasons, the tonnage and passenger traffic of American roads show a larger annual increase than those in England, and this increase in traffic involves a continual expenditure of large sums for betterments, equipment and additional facilities. As traffic increases, a better road-bed, more rolling stock and additional terminal facilities are demanded, resulting in continual outlays that increase capital accounts in advance of the growth of earnings. It is quite possible that for these purposes the total cost of American roads in the next ten years will be increased at least twenty per cent. to meet the growing demands of traffic, even should there not be a single line of new road laid. As a whole, our railways are light structures compared with those of England, yet they are sufficient for the use required of them. Their cost increases with the growth of traffic, and when our railways shall have arrived at the maximum of capacity and capitalization the amount of water that may have been incorporated in their stocks will be found after all to be only a moderate proportion of the total sum.—*The Stockholder*.

Illumination of Passenger-cars.

THE *Electrical Review* notes that a large party of representative railroad men from all parts of the country met at Altoona, Pa., recently, in the yards of the Pennsylvania Railroad, where a train of eight passenger-cars was in position, each one having a different kind of light. The first car was illuminated by ordinary coal gas; the second by the same quality of gas, with gasoline added to enrich the flame; in the third car the Lipsey burner, using the same enriched gas as the second car was used. The globe of this burner throws the light down, as well as a very considerable amount of heat, and looked like a Siemens' burner upside down. The illumination, however, was very good; in the fourth car the Siemens' burner was tried, supplied with the same kind of gas, but, owing to the location of the burners on the lamps, it threw a very distinct shadow on the floor of the car and on the seats. The fifth car was lighted with the oil-gas system used by the Philadelphia and Reading road for several years. The light was about the same as the ordinary gas-light. The seventh car had a gas made from gasoline, using an Argand burner, which made a beautiful light, and which is promised to be perfect on the application of several new principles by its owners. The last car was beautifully illuminated by the Brush electric light from a storage battery. The simplicity of the whole lighting apparatus, together with the excellence of the light, made the electric display the best of all. The gasoline used was rendered perfectly safe, in the event of accident, by its application.

Dr. Dudley, the chemist of the Pennsylvania Railroad, gave an interesting lecture on the several lights used, and said that the electric light was the coming light for railway use as soon as the subtle fluid could be generated as fast as exhausted. The doctor was kept busy answering the numerous questions from all sides on the durability and strength of the different lights.

South Australian Railways.

A DISCUSSION has been proceeding with reference to the construction of a railway from some point on the Great Northern Railway of South Australia to tap Southwestern Queensland and a part of the Southwest of New South Wales, but particularly the former. The matter has been referred to over and over again in the South Australian Parliament, and there is a general conviction that a line must be made. The difficulty is what route should be adopted. On this point a controversy has been going on for months between persons of opposite opinions, both sides claiming equal knowledge of the country and equal disinterestedness. Two routes have been suggested. Along one a survey has been made, and by that survey one section of disputants are prepared to stand. The other side suggest a different route, which is now being surveyed.

ON all European railways there are first, second and third class fares for passenger traffic, the third-class fares yielding the largest margin of profit. During the last ten years the rates have been generally reduced, and it has been found that the reduction has invariably increased traffic enormously, even peasants, who formerly did not dream of traveling, indulging in the luxury of riding behind the iron horse.

THE railway system in Ohio has cost more in building and equipment than that of any other State. It may be compared in millions of dollars with the other important States, as follows: Ohio, 825; New York, 808; Illinois, 588; Pennsylvania, 471; Missouri, 308; Minnesota, 307. The railways of these six States cost as much as all the rest of the railways in the United States.

A BILL is before Parliament (and thought likely to pass) which will give the English Railway Commission the powers of an ordinary court of law, limited to its special sphere. This commission has not been a wonderful success, but it certainly has done good enough to justify fully its establishment. Compared with the State commissions in this country it is admirable.

THE railways of India appear to have got beyond the experimental stage in the use of steel ties. In a recent parliamentary debate the fact was brought out that the directors of the Southern Mahratta Railway Company last year bought 99,600 steel ties from a Belgian firm.

THE new railroad cuttings about Bergen Hill, N. J., have opened large deposits of odd and rare minerals. They are continually visited by mineralogists and students from scientific schools.

A LETTER FROM THE INTERNATIONAL ELECTRICAL EXHIBITION.

[EDITORIAL CORRESPONDENCE.]

PHILADELPHIA, September 13th.

FROM an artistic and scientific point of view the International Electrical Exhibition now being held in this city is an unquestionable success. The buildings are spacious and the attendance large, and at night the scene is singularly beautiful. Thousands of electric incandescent lamps shed a rich flood of light through the galleries and corridors, and a fountain in the center throws jets of spray each illuminated by many-colored lamps whose rays follow the direction of the water. In the "annex"—the old Pennsylvania Railroad station—a lecture room is provided on whose walls are maps of the submarine cable systems of the world, and in this apartment an excellent orchestra plays every afternoon and evening while the morning is devoted to scientific lectures. The exhibits are rapidly filling up and the vacant spaces grow fewer daily. There is a conspicuous and agreeable absence of anything approaching the "cheap John" order, and it is evident that the management has given what the name implies: an International Electrical Exhibition. No exhibits are permitted that do not either directly or remotely derive or generate electricity as a force.

None the less is the exhibition disappointing. Disappointing to one who like myself regards electricity as the power of the future, and looked forward to the exhibition as an exponent of the marvelous in electrical achievement. From this point of view there is confessedly a disappointment. In the great and powerful steam-engines there is the constant reminder that electricity—the electricity of commerce—is but a reproduced force. The dynamo electric machines are beautiful and very powerful but back of them is the still more powerful steam-engine absolutely necessary to the revolution of the armatures and the consequent generation of the subtle fluid. Dynamos of great power are here, but to operate them, steam-engines of still greater power must first be set in motion. There is an inevitable loss of power in the transmission and we are confronted with the old, old truth that the created is ever inferior to the creator. We are forced to conclude that the key to the mystery has not yet been found. Electricity cannot yet compete with steam, and the day is far distant when the electricians can claim independence for their power. When for the purposes of generation the two natural forces, wind and water, can be made to furnish an abundant and inexhaustible power, then indeed may we look for the electric era; but judging by present results that time is in the distant future. The International Electrical Exhibition demonstrates most clearly that we have attained but the rudiments of electrical knowledge, and that well-nigh all recent investigation has been directed more to the adaptation of the known rudimentary principles than to creative discovery. Still, from this very ignorance we can take fresh heart. If with the little electrical knowledge yet obtained—learned, it must also be remembered, in little time—so much can be accomplished, the future opens to us a boundless field of possibilities. The difficulty is that the world has apparently begun at the wrong end of electrical research and studied the application of electric force before the problems of its generation.

Up to the present time, as judged by the exhibits, the chief, if not the only practical result that has been perfected, is the application of electricity as an illuminating power. One general glance upon entering the Exhibition Hall demonstrates that electric illumination is the chief exhibit, and it is a grand one. Here at least we can immediately realize benefits. There has never been a building so superbly illuminated as the Exhibition Hall is today, and the light is simply perfect. There is no glare, and an absolute steadiness about the perfected incandescent electric lamp, while a softer, mellower tint could be imparted by nothing but our solar luminary. The Edison and Weston systems of electric lighting have extensive exhibits, while the exhibit of the Brush system is not yet completed to a point that would permit of just criticism. As between the methods of the former two systems an impartial judge would, I think, award the palm to the Weston. The quality of the light is not appreciably better, at least to one who is not a professional electrician, but the dynamo machines are less cumbrous and certainly superior in workmanship. I was shown a Weston dynamo which was stated to be capable of the same results as an Edison dynamo that outweighed it a dozen times. The capacities of these two dynamos were stated to be fifteen hundred incandescent lamps each, and after viewing the smoothness of their workings and the wonderful brilliancy and steadiness of the light produced, the on-looker is apt to view the first gas-jet he subsequently meets, with the mingled awe and superiority that youth is wont to exhibit to age. Gas, he considers, has about run its race, and while it has been a tyrant for nearly a century, it must spend its few remaining years in due humility.

In other departments of the exhibition there is little novelty save in the application of electricity as a force or its generation as a result. There are various machines run by electric motors, but their accomplishments as mere machines do not strike one with much interest. The fair sex gather in numbers to witness the operation of sewing machines run by small dynamos, but the sewing is the same as that accomplished by our mothers in days gone by. In the "annex" there is an ingenious brick-making machine which registers the number of bricks made by means of an electrical register in the main building, but I must confess that the general public is far more interested in the mechanism of the machine itself than in its one electrical feature of registering. And this is a fair example of the difficulties of rendering the exhibition interesting from a purely electrical point of view. The action of the electricity is hidden and the work-a-day people are chiefly interested in that which can be seen and handled. They are surprised at the accomplishments of electricity but the action of the dynamos is so simple that there is but little to look at in them. On the same plan there is a Roosevelt organ in the gallery of the main building which is played by electricity, the performer sitting at a key-board a dozen yards from the instrument; but the real interest of the performance—the electrical transmission from key to pipe—is hidden from view and the public must perforce either watch the performer or the organ, and neither are very thrilling spectacles. The United States War Department and the Ordnance Bureau have exhibits, but neither are very interesting. They

form good pictures of "still life," for the articles exhibited are in a state of quiesence and seem likely to remain so. A feature of the exhibition, and one which attracts considerable interest is a Cottrell printing press run by a small Daft motor, on which is printed the *Electrical World*, an interesting and prosperous weekly journal, now in its fourth volume, devoted to the progress of electrical research and application.

Of course there are extensive exhibits of telegraph and telephone systems, and the display of synchronous and multiplex telegraphic instruments is very extensive; but as before stated, the public cannot view the action of the electric spark, and there is very little surface-interest, so to speak, in the mere instruments themselves. To a greater or less extent nearly all of the exhibits are open to the same objection: they are of great interest to the electrician and are examples of the varied and useful application of electricity as a force; but to the public they seem but old devices operated by new methods and therefore fail to attract marked interest.

From a strict railway standpoint there is a surprisingly small number of exhibits bearing directly upon railway interests, but though few, these exhibits are among the most interesting in the whole display. I had hoped to see exhibits of electric head-lights for locomotives and of systems for the electric lighting of railway cars, but as yet there is nothing exhibited in this category. Neither, strange to say, has there been any exhibit tending to demonstrate the practicability of electric propulsion. There is, indeed, an insignificant little corner where a few yards of track are laid for the purpose of running an electric car, but the exhibit is not completed and under no circumstances can approach what such a display should be. The general impression of this exhibit is that of trifling with a most important subject. In the "annex," however, a practical railway man can find several interesting exhibits, and these are conspicuous for the fact that they are also interesting to the public from a mechanical point of view. The Union Switch and Signal Company of Pittsburg, have a very extensive exhibit of their various railway signal devices which are illustrated with accurate models. The Wharton Railroad Switch Company of Philadelphia, likewise have an interesting exhibit of the Hall Interlocking Switch System which they control, and it would be difficult to find a more complete and satisfactory electric switch and signal system than is here furnished. One of the most novel railway signal systems is also on exhibition in the complete model of the railway cab electric signal exhibited by the Railway Cab Electric Signal Company of New York City. This signal system differs from others in use in giving the signals in the cab of the locomotive either by means of a bell or whistle, an electrical circuit being maintained from the locomotive to the rail and thence through the tender back to the locomotive for the purpose of operating the signal.

The exhibition has had an additional interest this week from the fact that the United States Electrical Conference has been in session here. The attendance at the conference was large, and the last session will be held to-day.

Altogether the Franklin Institute, under whose auspices the exhibition is held, may be congratulated upon the success of its enterprise and undoubtedly the impetus given to electrical research will be great. And this, despite the disappointment I have spoken of, for this disappointment is wholesome. If a visitor to the exhibition is at first tempted to exclaim, "How much the world knows!" he will shortly realize the aptitude of the more humble exclamation: "How much the world has to learn!" And it is this realization of comparative ignorance that will be far greater in its effects than the most extravagant pride in the achievements of American electricians. The exhibition is rather an indication of the "to be" than of the "is," if I may be pardoned for the use of such metaphysical expressions. It is an indication of what we have to learn and accomplish rather than a display of present results. As such it should make us truly wise, for it is well said that wisdom is but the realization of ignorance. Calmly viewing the display, I should say that the problem of electric illumination has been fully solved, but that in other branches of usefulness electricity is as yet an infant. That it is meeting with a rapid and healthful growth is evident, and with this we must be content for the present. The exhibition will, I think, have one marked and beneficial effect, and that is to direct more attention to the problem of electric generation than to its immediate application.

It only remains for me to add that the management extends every facility to those seeking information and treats representatives of the press with great courtesy. Those having charge of the exhibits also manifest every disposition to enter into explanations when desired, and the whole exhibition is imbued with a spirit of dignity befitting the high character of its motives.

J. Bruen Miller.

FUN ON THE RAIL.

The unintelligibility of a brakeman's call when announcing a station is proverbial. The other day, however, one called this station plain enough. There was a sheriff on the train with some prisoners for the penitentiary, and upon announcing the arrival here the brakeman said: "Yuma! Change clothes; ten years for refreshments!" —*Yuma Sentinel.*

When a Mexican feels aggrieved because a railroad company has not sent him a pass, he just goes out and pulls up a few rails. This is a great deal more sensible than moping around and grumbling for six or seven days. —*Burlington Free Press.*

"Why is a woman always too late for the train?" asks an exchange. Because she isn't. Pretty often she is nearly an hour too early for the train, and runs several blocks for fear she will miss it.—*Norristown Herald.*

A conductor on a railway used to pass his mother free; but he was discharged from service, and his younger brother asks: "Who will car-fare mother now?"—*Exchange.*

"The dog came for me," said the tramp, "and I played I was a railroad contractor." "What did you do?" "Made tracks."—*Rochester Post-Express.*

It is a singular misnomer to call ticket-brokers "scalpers." Though they may slaughter rates they never attempt a raising of fare.—*Exchange.*

A Western paper announced a railway disaster recently with the heading, "Boiler Empty and Engineer Full."

American Railroad Journal.

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NEW YORK, SEPTEMBER, 1884.

Principal Contents of this Number.

ONCE MORE.

ONCE more we would remind our readers that the AMERICAN RAILROAD JOURNAL is the only railway magazine and review published, and that in our endeavors to continue successfully in this particular branch of railway journalism, we seek coöperation from them. Since the inauguration of our new policy in the June JOURNAL we have published seventeen contributed articles on various subjects of interest to railway and tramway officials, managers and employés, and they have met with marked favor. Our staff of contributors is steadily widening but there will always be room for interesting contributions from whatever source they may come. The sole requisites are that they shall be well-written, appropriate to the character of the JOURNAL, and original in their treatment. For all such contributions we have a steady demand and for them we pay a good price upon publication.

Once more we urge our readers to recognize in the fact that the JOURNAL is the only publication of its class, a claim for their active support, with the full assurance that with this support we will be enabled to enlarge our field of usefulness, bearing in mind the fact that the laborer is worthy of his hire. We do not ask nor do we wish gratuitous assistance of this kind, for we act upon the principle that an article good enough for publication in our columns is too valuable to be given away by its author.

WHAT WE THINK OF IT.

WE have received a number of letters requesting our opinion of an organization located at Youngstown, Ohio, and calling itself the "Railway Invention Bureau." Our inquirers were chiefly inventors of railway appliances who are in doubt as to the expediency of participating in the operations of the Bureau and seek information relative to the nature of the organization and the character of the men controlling it. After a thorough investigation we are compelled to state that the Bureau does not appeal to us either as a useful or as a particularly beneficent organization. As far as learned the character of its members is good and we will therefore assume that its dealings are scrupulously fair, but none the less does it seem as if the Railway Invention Bureau is not an organization destined to achieve practical success.

The Bureau is stated in numerous circulars to be a branch of the "Humanitarian Invention Association," and having thus laid claim to philanthropy it must be viewed from a philanthropic standpoint. Had it merely claimed to be a business organization designed for the legitimate profit of its promoters and managers, such examination and criticism would be manifestly unjust, but as it appeals to inventors in the guise of beneficence it must substantiate this claim or else receive merited criticism.

The prospectus of the Bureau reads well and of course the advantages offered by the organization to both railway inventors and to railway mechanics and car-builders and the like are conspicuously enumerated. The Bureau claims to have the services of well-known railway officials and experts who will test the value of each invention submitted; and provision is also made for procuring and controlling the patents thereon. Mechanical errors are to be pointed out and the inventors will be given hints as to the best means for overcoming these difficulties. All this sounds well, and did the Bureau lay no stress upon its philanthropic character, criticism would be disarmed save as to its practical benefits. We will consider these later, but the first question to be determined is whether or not the Bureau may be justly deemed a branch of an "humanitarian" association. We should say it could not in view of one of its chief provisions, which is to the effect that an examination fee "not exceeding $25 in ordinary cases" is to be paid by the inventor before the Bureau will examine his device.

Here seems to be the milk in the cocoanut. It would be an easy thing for the Bureau to state that it would give every invention submitted a cursory glance with a view to determine its palpable merits or defects, free of charge or for a trifling sum demanded as an earnest; but the examination fee in *all cases* is placed at a good figure and there is no distinction drawn between inventions whose impracticability will be determined at the first glance and those which will require considerable examination and trial to determine their utility. At the very lowest estimate, at least seventy-five per cent. of railway patents could instantly be deemed practically valueless by any railway official at the first glance and fifty per cent. of the remainder could have their usefulness demonstrated without a further test than the models offered. Thus on this remarkably low estimate, but one out of every eight railway inventions would require a practical test, and at the rate of $25 for every invention examined, the average expense of every practical test under the supervision and by the methods of the Bureau would be at least $200. Probably those inventions that would be deemed worthy of being practically tested do not come under the head of "ordinary cases," and as there is no maximum fee given we are in doubt as to the precise tax over and above $200 to which the fortunate invention would be subjected.

We fail to see any great beneficence in this system of examination. We are not saying that this cost would be very excessive, for it often occurs that practical tests are most difficult to obtain; but we do say that were money-making individuals to adopt a scheme of this sort and conduct it honestly too, and at these figures, it would prove a very profitable undertaking, and there would be no call for them to lay claim to beneficence or philanthropy.

Concerning the practical benefits of the Bureau we shall consider them in precisely the same light as we would were it an ordinary business concern operating for honest profit. After a careful examination of the prospectus we doubt if the Bureau could ever prove of practical benefit to either railway officials or to inventors. Any practical railway man could judge of the merits of an invention without the necessity of having it tried before a board of examiners. From what we know of the opinions of railway mechanics, car-builders and road-masters, we feel sure that as a class they will not avail themselves of the benefits offered by the Bureau in the inspection of the thousand and one inventions that accumulate from year to year. Among the names of the Board of Managers of the Bureau but one is familiar to us as that of a practical railway man, and the others we understand are those of men in other walks of life, the President being a clergyman; and just wherein these gentlemen are competent to offer great advantages to railway inventors we fail to see.

As was remarked by a recent contributor to our columns those inventors who have patented *valuable* inventions may be sure of reaping a reward, and it is a mistake to suppose that railway officials are slow to examine really meritorious devices. If they show reluctance to examine with minute thoroughness any invention that may be submitted them, the inventor might as well make up his mind that the fault lies not with the railway officials but with the invention. All the Invention Bureaus in the world cannot make a poor invention good, and as far as mechanical errors are concerned, any competent railway official will be only too glad to suggest means for overcoming them if the ultimate value of the invention would be thus obtained.

The Railway Invention Bureau may be, and doubtless is, an honestly conducted concern, and its managers may be men of intelligence and discretion; but we respectfully assert that the Bureau appeals to us neither as a philanthropic, practical, nor useful institution.

PROTECTING A MONOPOLY.

UNDER the above title, the following extract appeared in the New York *Times* of September 1st:

There is a complaint among many railroad people and brokers that the decisions of the Committee on Stock List of the Stock Exchange in regard to the engraving of securities have a tendency to place a monopoly of the business in the hands of the American Bank Note Company and of the Franklin Bank Note Company, which, it is asserted, is controlled by the American. The ground of complaint among these people is that they could get their work done quite as well by other companies for much less money, but they know that the Stock List Committee will not list any securities which are not engraved by the American Bank Note Company. The railroad people feel aggrieved that they are not allowed to have their work done wherever they please, and the stockholders and directors in the younger bank note companies declare that it is an outrage that they cannot compete on even terms with the American.

A *Times* reporter has visited a large number of persons interested in the engraving of securities, including officers of loan and trust companies and railways, and also brokers doing business in the Exchange itself. From

statements made by these persons the state of the case appears to be this: That the Stock List Committee will agree to receive securities engraved by the American Bank Note Company before they have been begun, but will not promise to receive the work of any other company until after examination. Whenever a railroad company chooses to take this risk and have its bonds engraved by some other company, the securities are rejected by the Stock List Committee, and the company is, in the end, obliged to go to the American Bank Note Company or the Franklin. Among the corporations which have had securities printed by other bank note companies and rejected and have had to have them done by the American are the Baltimore and Ohio Railroad, the Rome, Watertown and Ogdensburg, the Ohio and Mississippi, the Denver, Utah and Pacific, the Oswego and Syracuse, the New York, Susquehanna and Western, and the Austin and Northwestern. The State of Virginia has also been a sufferer.

The Stock List Committee claims that it has the best of reasons for its course of action. A member of it said that two great points had to be considered—the excellence of the workmanship and the security of the company. Only the best possible workmanship could be accepted by the Exchange. Secondly, a bank note company must show that it had the best possible means of protecting the plates of securites against injury or loss in any way. A small and weak company could not guarantee this, and, therefore, it was better to go to the American. The moment any of the younger companies could satisfy the committee on these points their work would receive equal consideration, and, if found worthy, would be accepted. "That is all there is in this matter," said the member.

"I consider the course of the Stock List Committee unjust," said an officer of a trust company. "I am convinced that there are bank note companies in the city which can meet all the requirements of the Stock Exchange. I know that their prices are lower than those of the American, and I know that their work is always rejected or else no action is taken on their applications. It does not look like fair treatment, does it?"

"I know," said a member of the Stock Exchange, "that the American Bank Note Company has a monopoly of the business. I have been compelled to get work done by them for $2,000 which I could have had done elsewhere for $1,400, but the Stock List Committee would only guarantee to accept work by the American. I am going to bring the matter up before the Governing Committee."

"We have suffered considerable loss of time and money," said a railroad man. "We wanted certain bonds listed, and we submitted them to the Stock List Committee. They rejected them, and we had to have them done by the American."

"Yes," answered a railroad contractor, who does a large business with the American Bank Note Company, "I know, and it is generally well-known, that the American Company has a monopoly in printing securities which are to be listed on the Stock Exchange. What has been already stated to you is correct; there are other companies which can do the work just as well, and can give just as good security, but they cannot get their work accepted, even in spite of the fact that their prices are lower."

"What I want to know," said another gentleman, "is this: Why shouldn't a railroad company be permitted to judge for itself on this question of security? It is quite as much interested in it as the Stock Exchange can be, yet the Stock List Committee compels it to go to the American. Any railroad which proposes to list bonds will not take the risk of having them rejected when they learn that the committee will not guarantee to accept any work except that of the American. I am acquainted with the work of other bank note companies and know that they can do as well as the American. I am acquainted with the responsibility of their directors, and think it should be satisfactory to the Stock Exchange."

It is asserted that American directors hold over one-half of the stock of the Franklin, and that a show of competition is kept up between them which is not genuine. It is also asserted that a sub-committee was appointed by the Stock Exchange Governors to examine the condition of the minor companies and that a report favorable to certain ones was returned, but was quietly buried without action. The business of engraving securities amounts to $3,000,000 per year, and has been practically controlled by the American company since 1858. Not more than 5 per cent. of the business is done by other companies. Minor companies, it is asserted, have been invariably swallowed up by the American.

The *Times* here attacks an acknowledged grievance among railroad and financial managers that should be frankly discussed. Any intelligent financier can add to the above list of corporations forced against their wishes, and in spite of their judgment, to accept at the hands of the American Bank Note Company models made up from ancient and obsolete vignette and lathe-work, every line of which is as familiar as the alphabet; or else subject themselves to the heavy expense and interminable delays represented to be necessary to the production of special designs. The only danger from the forging of such securities would seem to be the probability that the counterfeits would be so much better than the genuine as to deceive the very elect.

What, then, are the claims of this modest corporation, and how can they be substantiated as against those established at a later date? What are the safeguards thrown about this business inaccessible to the younger companies? "Excellence of workmanship and security," says the Stock List Committee. It is idle for the old company to claim exclusive control of artists, engravers, heads of department and skilled workmen in the various branches of this complicated business. From the nature of the case, they must themselves have trained a small army of competent persons—far more than they can furnish with steady employment. What has become of all the officers, subordinates and employés of the half-dozen or more competing companies absorbed by the old organization? It is generally understood that a large number of these have been provided with comfortable sinecures, but there are many who may not have been considered of sufficient consequence, and others who do not take kindly to such an existence. Many more, and these the best engravers, are specialists—in independent circumstances—ready to accept work to a certain extent, limited by their own desires or inclinations, from any reputable company or individual. Again, the march of improvement has not stopped at the line of the massive or the delicate and expensive machinery indispensable to the operations of a bank note company. The plant of one of the junior companies is claimed by its makers and acknowledged by experts to be beyond question the most complete, perfect and ingenious of any yet produced for the purpose. An organization so equipped, including among its directors and working force graduates and responsible managers of all the important departments in the older companies, backed by sufficient capital and a rapidly extending business is justified in guaranteeing to its patrons work equal in design and execution to that furnished by any of its competitors. Why not? As to security, one at least of the younger companies carries on the bulk of its business in its own building, provided with ample safes and vault-room absolutely fire-proof. The vaults of the different safe deposit and trust companies are at command and might prove as great a convenience under certain circumstances to them as to banks and other monetary institutions. Integrity and honorable dealing are not the exclusive attributes of any one man or set of men.

We have devoted an unusual amount of space to the discussion of this subject as one of great interest and importance to our constituents, and we predict that the day is not far distant when these junior companies will be heard, and when railroad managers, after satisfying themselves as to responsibility and facilities, will be able to

make their contracts without a fear that the arbitrary dictum of the Stock List Committee may force them to pay tribute to the most unreasonable and inexcusable monopoly of the day.

EDITORIAL NOTES.

A CORRESPONDENT writes us to inquire if we are not a little inconsistent in the use of the word "railway" as a generic term, while the word "railroad" is incorporated in the title of the JOURNAL. Railway is a comparatively new word in this country, and at the time the JOURNAL was established nearly fifty-four years ago, "railroad" was universally applied. We have been quick to recognize the superior adaptability of "railway" and have adopted it, but at the same time have naturally retained the original title of the JOURNAL. Newspapers were originally called "news-letters" and there are yet a number of publications with the title of *News-letter* which never use the word in any other connection.

* * *

ANTI-MONOPOLY indulges in some strange freaks, and is guilty of occasional inconsistency. With a view to protect their patrons and offer them every facility for cheap cab-fare, the Harlem Railroad Company recently entered into an arrangement with the New York Cab Company by which the latter were to have an office in the Forty-second street depot. But no! The grasping avaricious corporations must be suppressed, and a judicial injunction was immediately sought by an outside cabman to restrain this infamous bargain. The poor cabman is absolutely dependent upon his facilities for swindling the public and these facilities must meet with no interference from VANDERBILT and his myrmidons. Of course the public are supposed to take sides with poor cabby in his heroic struggle for extortion, and doubtless there are a few fools who would hail his success as a signal victory of honest labor as opposed to corrupt wealth. In sober truth this specimen of anti-monopoly warfare is about as sensible as any that are brought to public attention.

* * *

HONESTLY, were we capitalists in the ordinary sense, and were we subjected to the petty persecutions that all wealth must nowadays experience, we should be inclined to say to these *soi-disant* anti-monopolists: "All right, have your way. We will not attempt to interfere with the march of progress. We will spend our money in private enjoyment, and take no further interest in the building of railways, the formation of transportation and manufacturing companies, or of corporations for any purpose whatever. If you can get along without us, why do so." Perhaps we might not find much financial profit in this course but we modestly opine that the anti-monopolists would be the greater losers, and until they get a wholesome lesson of this sort it will be impossible for them to comprehend that capitalists are not such heinous creatures as they would have us believe.

* * *

THE melancholy list of wrecked banks and exposures of rascality on the part of trusted officials is increased by the ruin of the National Bank of New Jersey at New Brunswick, and a darker shadow falls upon the picture in the suicide of the two men involved in the ruin, Cashier HILL and President RUNYON. Are there any new features in the ruin of this bank? Must the public look for new causes which brought about the disaster, and are there any new and useful lessons to be drawn from the scene of desolation of homes and fortune? Alas, no! It is the same old story, and the eager, anxious crowd of stockholders and depositors clamoring for an explanation of the ruin are given the same old answer: "Wall street."

* * *

WALL street is very indignant. Wall street is also standing upon its ultra-respectability and it repels the constant allusion to its evils as most unjust and ungentlemanly. Surely Wall street is not responsible if bank officers seek to increase their wealth by dabbling in its muddy pools, and it is none of Wall street's business to inquire whose money appears in the transactions. To be sure Wall street knows perfectly well that the money is stolen money, but that can't be helped—Wall street didn't steal it. There are many professional gamblers, who from certain causes—let us hope that a spark or two of natural honor is back of them—will hesitate to fleece a victim if they know he is tampering with his employer's money; but then it would be very wicked to compare Wall street with a common gambler—Wall street! Just think of it! With its wealth, power, and the social position of its devotees. How horrible the thought!

* * *

AND yet let us think a little further. Let us suppose that a body of wealthy and influential men to the number of thousands, should organize a faro table with a capital of a billion dollars and with ordinary stakes of a million. Would not the laws of the State step in and throttle it, and would not the public rise to a man for the suppression of the unholy business, and would not these same Wall street brokers be amongst the most virtuous enemies of the wicked gamblers? Certainly they would. And yet what is Wall street but a game of faro on this same princely scale, and wherein is the difference between "chips" of ivory and those of paper? Between the gambler's currency and the "securities" of Wall street? How true to nature was quaint ROBBIE BURNS when he exclaimed:

"O wad some power the giftie gie us,
To see oursels as others see us!"

Tramways.

American Street Railway Association.

President.—William H. Hazzard, Brooklyn, N. Y.
First Vice-President.—James K. Lake, Chicago, Ill.
Second Vice-President.—George B. Kerper, Cincinnati, O.
Third Vice-President.—D. F. Longstreet, Providence, R. I.
Secretary and Treasurer.—William J. Richardson, Brooklyn, N. Y.
Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

THE APPROACHING CONVENTION OF THE AMERICAN STREET-RAILWAY ASSOCIATION.

ON October 15th the American Street-Railway Association will hold its Third Annual Convention in New York City. With this fact in view a representative of the JOURNAL called upon the Secretary, Mr. RICHARDSON, for reliable information concerning the condition of the Association and the prospects for the success of the coming gathering; and the results of this interview are published in another column. We recognize this Association as a factor of the greatest interests to tramways in this country and copies of this issue of the JOURNAL are mailed to the office of every American tramway, while later information will be obtained for our October issue which will likewise be sent to tramway officials throughout the country in the hope that many of them will be persuaded to attend the Convention and by their presence contribute to its success and to the permanent benefits of the organization.

It is gratifying to observe that nearly fifty per cent. of the corporate wealth of tramways is represented in the Association by sixty-one leading companies. It is also gratifying to observe the steady increase with which the Association has been favored since its inception. But it is not gratifying to note that less than fifteen per cent. of American tramways are enrolled as members. This disproportion of membership to capital represented would seem to indicate that the small roads have largely abstained from joining the Association, and this inaction on their part might be accounted for in two ways did not facts obstinately prevent such constructions. They might abstain on the ground of expense but the fees and dues of the Association are but nominal. The admission fee is but $25 and the annual dues $15, and there is not a tramway in the country that in the face of these absurdly low sums could decline membership from motives of economy. It might likewise be claimed that the large companies would overshadow the small whose membership in that case would be purely ornamental and perfunctory, but every company casts a single vote and all are equally powerful in the Association. At the first Convention this question was carefully considered and the representation of each company was fixed at a unit in order that this objection could not be urged by the companies of small capital and equipment. With the demolition of these adverse arguments it is difficult to comprehend why so many companies are unrepresented in the Association and it is certainly to be hoped that the approaching Convention will witness a large increase of membership.

Doubtless many tramway officials are tempted to ask "*quid bono?*" or give vent to an equivalent expression when requested to join the Association, and to these we say there is every reason why they should acquire membership. The general interests of tramways are identical whether they be large or small, or operated through populous or rural districts. Track-construction, repairs, and cleaning, the care of horses and stables, the choice of motive power, the employment of labor, the care of cars, their ventilation, heating and lighting, the taxation of companies and the licensing of tram-cars are questions which every tramway is forced to consider, and it is these and kindred questions that the Street-Railway Association considers. The combined wisdom and experience of a hundred roads is placed at the disposal of every individual road, and from a wisely digested plan of operation the various committees are enabled to arrive at correct solutions of perplexing problems incident to the proper conduct of tramways. Surely the returns from the trifling expenses attendant upon membership and the small trouble involved in attending the meetings are amply sufficient.

It is surprising that tramways in this country did not form a National Association sooner than they did, but it is better late than never, and as a matter of self-interest alone every tramway official should be anxious to enroll his company among the members of the Association, nor should he stop there. The example set by the American Association has been followed by the formation of local and State Tramway Associations, and these are of direct interest to every road. Their formation should be continued and ultimately there should not be a single State in the Union in which the interests of its tramways are not guarded by a State Association. Whether they should in any way be connected with the American Association is open to question, but certainly their members should individually claim membership in both.

The AMERICAN RAILROAD JOURNAL was the first railway publication in the country to devote a portion of its space in each number to the interests of tramways, and this policy was inaugurated before the American Street-Railway Association was organized. Since the formation of this organization the JOURNAL has watched its progress with much interest, and is glad to praise it without stint. It might have degenerated into an association for a few roads, consulting selfish interests and being manipulated for the glory and profit of a few individual officials. It might have languished, and after a few slim Conventions been abandoned by its promoters. Instead, it is a live,

healthy organization, treating its members impartially, irrespective of the wealth of each, and devoted to the consideration of problems that are common to all tramways now in operation; and it is the duty of every tramway organization to sign the roll of membership.

In the United States and Canada, there are upwards of five hundred incorporated companies controlling and operating tramways. Many of these companies conduct several lines each and the total number of tramways in successful operation is doubtless nearly six hundred. That the membership of the American Street-Railway Association should at present be limited to but sixty-one of this total is not a pleasant contemplation, and so far as we are able we shall lend our energies toward increasing this membership until it has reached high-water mark, which can only be touched when the membership in the Association equals the total number of tramway companies in America.

THE BROADWAY FRANCHISE.

OF all the transparent steals for which that estimable body of rum-sellers and political "heelers," the New York Board of Aldermen, have been distinguished, the giving of the valuable franchise for the construction of a tramway on Broadway to the Broadway Surface Railroad Company is unquestionably the most astounding. The iniquitous measure was passed in the face of universal disapproval, with but one dissentient voice, and Mayor Edson promptly vetoed it. His reasons for so doing were squarely stated, stress being laid in the first place upon the necessity for keeping our main thoroughfare open to traffic, and secondly, that even should such a road be constructed, under no circumstances should so valuable a franchise be awarded for no consideration whatever on the part of the tramway corporation. Naturally it was not thought that the Aldermen would be restrained by any such calm reasoning as this, and an injunction was sought in the courts forbidding the Board to pass the measure over the Mayor's veto. Judge DONOHUE granted the injunction, but in a few days it was mysteriously withdrawn, and in the most bare-faced and shameless manner the Aldermen held a hurried and special meeting, at which the veto was overridden and the city robbed of a million dollars, since that sum could have easily been obtained had the franchise been put up for sale at public auction.

The fury of the citizens was loud and deep and an indignation meeting was held in Chickering Hall, at which Mayor EDSON presided, to protest against the outrage; and the public are so thoroughly aroused at the utter disregard of their rights, that the future construction of the road under its present franchise is extremely doubtful; but the ventilation of the steal will have one effect, and that is to call attention to the insuperable objections that present themselves to the construction of a tramway on Broadway. We argued at length upon this point in the August JOURNAL, and shall continue the argument until we are convinced that the points adduced are unsound. We are always open to conviction, but like a certain female witness we have yet to meet the argument that could convince us.

The virtuous Aldermen, it is understood, repel the suggestion that the franchise was granted without consideration, and for once their statement is implicitly believed. Whether the "consideration" came in the form of cash outright or in snug little blocks of stock in the company is as yet in doubt, but we would not be guilty of such injustice to our city fathers—step-fathers would come nearer the mark—as to suppose that they would forego their perquisites. As often stated, the JOURNAL has no sides in politics but we would heartily join in any movement to return the present Board of Aldermen of New York City by handsome majorities—return them to the slums and gin-mills whence they came, and where they are admirably fitted to shine with undimmed luster.

CABLE RAILROADS.

(Continued.)

BY W. W. HANSCOM, M. E.

[Written for the AMERICAN RAILROAD JOURNAL.]

WHEN the Clay street road had been in operation about three years, its success became so marked that the owners of the Sutter street horse-car road saw in it a means of relief from the over-working of the horses over the grades of that street, so they determined to convert it into a cable road. The grades were much lighter than on Clay street, yet some of them were too steep for horses, the steepest being one in thirteen and seven-tenths.

As this road was kept in operation all the time the tube was being constructed, provision had to be made for covering the excavation so that the horses could pass over, or else a rope was used so as to allow the horses to walk along the sides for such distances as the ground was open. On this road the track which was already down was the ordinary street track on stringers, and it was determined to continue that in use, and to construct the tube so as to interfere as little as possible with the existing conditions. Castings were made somewhat similar to those first put in on Clay street, and the ties were cut so that the castings could take and support the inner ends, while the outer ends remained under the stringers which carried the rails.

The shape of the tube was flat on the bottom, with vertical sides and curved in at the top to the center, where the angle irons forming the slot were attached to each casting, the castings being placed about three feet apart as on Clay street. The sides and bottom of the tube were formed of wood, as on Clay street, and wherever plank was used on the street for paving, it was also used between

the tracks for the same purpose, but in other places the space between the tracks was paved with stone.

The principal changes made from the Clay street road in the construction of the Sutter street road, consist in the grip for taking up and carrying the cable, the plan of driving drums for moving the cable and the method of switching or changing from one track to the other at the end or any point of the route that may be desired. This is accomplished without the use or necessity of turn-tables as the dummies are not required to be turned, but run either end forward. The grip differs from the Clay street grip in the way in which the cable is taken into the jaws, and the manner of operating them by a lever instead of a screw and wedge. The cable is taken into the jaws at the side, they having a vertical instead of a horizontal movement as on Clay street, which allows the grip to be lowered vertically over the cable until it enters the open jaws, by a single vertical movement. The

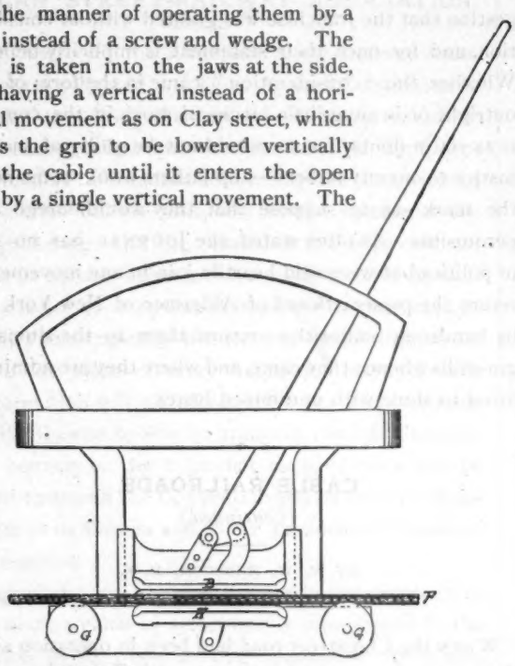


FIG. 1.

grip, as a whole, being fixed to the dummy, it has no mechanism by which it can be lowered down to pick up the cable, so that either the track and road-bed have to be depressed to carry the grip down with the dummy to the cable or the cable has to be raised at the point on the road when it may be desired to take the cable into the grip. As the lower jaw of this grip lies in the same vertical plane as the cable, either the cable or the grip have to be moved sidewise so that the cable may pass the lower jaw in coming up to enter between that and the upper.

Fig. 1 is a side view of the grip which includes the operating lever as well as the jaws. B is the upper jaw, H the lower jaw, G G the two rollers having grooved circumferences in which the cable lies and runs during the stoppage of the car, and F the cable. This grip is operated by a lever, and the necessary power is obtained through a toggle-lever or joint combined with a long arm so that by adjusting the dies of the jaw which clasp the cable, any desired pressure may be brought to bear upon it. It will be seen that only the upper jaw B is moved, the lower one H, being stationary.

The cable F, when in the grip, lies in the two friction rollers G G, whose grooved circumferences are slightly above the upper surface of the lower jaw H, so that the cable in passing through will be free from contact with it and escape abrasion. As the upper jaw is brought down by the lever upon the cable, it carries the cable down upon the lower jaw, thus clamping it between the two. Two methods are in use for "picking up" the cable or putting it into the grip preparatory to starting the car. One is by means of a hook, which, having a long handle, is put down through the slot of the tube and lifting the cable by a semi-circular movement, raises and carries it into the open jaws. This may be done when the cable is small and there is not much tension on it, and it is desired to do it while the dummy is stationary. It is often done at points where the cable may from any cause have been dropped from the grip and it is desired to replace it; but at fixed points where the cable has to be released and taken up again while the dummy is in motion, especial arrangements are made to raise the cable by a sheave, so that it may be at the level of the opening between the jaws. This sheave will naturally be in the path of the grip as it comes along, and in order for the latter to pass it, the track and slot are deflected laterally, and as soon as the grip has passed the sheave, the track is immediately deflected back again to its normal line before the cable shall have sagged, and the open jaws are carried on to the cable.

The engine-house as first constructed for this company was located some three hundred feet away from Sutter street, and the drums then used were two in number for each cable, one being connected with the engine by spur-gearing, and the other being carried in movable pillow-blocks on a sole-plate so arranged that the movable drum could be placed farther from, or nearer to the stationary one. These drums were about eight feet in diameter and had several grooves around them of sufficient size and depth to take the cable, which was nearly three inches in circumference. A number of turns or wraps of the cable was taken around these two drums until the friction on the drum connected with the engine was sufficient to drive the cable. As the cable stretched from use, the movable drum was placed farther away from the other, thus taking up the slack. The cable in passing into the engine-house from the street and out again, is guided by suitably placed sheaves. The engines which were used to drive these cables were twelve inches bore by twenty-four inches stroke, there being four, so arranged that any one of them could be disconnected from the rest by uncoupling the connecting rod, three being in use at one time. These engines had a Meyer cut-off adjusted by hand, and the regulating was done by a Gardner governor. An extension of the cable being made on Sutter street, another engine-house having two of the same size and kind of engines was constructed for driving this extension.

During the past year a new engine-house and driving machinery have been constructed, located on Sutter street, and all the cables now in use are driven by one pair of compound non-condensing engines. Additional cables are intended to be driven by these engines, the latter having ample power for all purposes required. The location of the new engine-house involved the running of one of the cables around two corners which were each right angles. The sheaves, or rather pulleys, used in carrying the cables around the curves are placed with the axes vertical, and the faces of the pulleys are in such a position laterally in reference to the slot of the tube that the grip, in

passing, will not touch them. They are placed so close to each other on the curve that the lateral deflection of the cable from one to the next is slight, and not much side strain is brought upon the grip.

The driving-drums in the new engine house are different from those used in the former house, Fig. 2 showing the arrangement. A is the drum nearest the street, B a similar drum immediately in the rear, the two being connected by spur gearing, each of the drums having but a

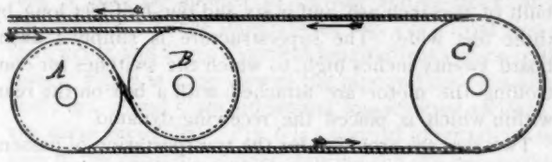


FIG. 2.

single groove. C is a sheave which is placed upon a traveling carriage so arranged that any slack that may occur may be taken up while the cable is running similar to the sheaves at the ends of the road on Clay street. The cable comes in from the street and, passing over the rear drum B, goes around and up over A, thence back and around the sheave C, and thence in a similar way to that shown in the illustration of the method of the Clay street road, except that the cable, when it comes from the street and goes on the drum B, is on about the same level as the cable in the tube in the street, and does not require the vertical sheaves as used on Clay street. These drums are the same as have been used for years on the Gordon Plane in Pennsylvania. The grooves of the drums are lined with wood to save the wear of the cable.

The engines have cyliners twenty and thirty inches in diameter by forty-eight inches stroke, making sixty revolutions per minute. They are connected with the driving-drum shaft by grooved pulleys and cotton-rope belting, the pulleys being seven and twenty-four feet in diameter, giving about eighteen revolutions per minute to the driving-drums, and a speed of about seven and seven-tenths miles per hour to the cables.

There are three sets of tubular boilers for generating steam for the engines, each set being independent, yet so arranged that either set may be connected with the engine or all at the same time. Only one set is at present required at a time, changes being made from one set to another when occasion requires.

(*To be concluded.*)

The Approaching Convention of the American Street-Railway Association.

AN INTERVIEW WITH SECRETARY RICHARDSON.

BEING anxious to keep our readers posted and to further the interests of tramways, a representative of the JOURNAL recently called upon Mr. William J. Richardson, Secretary of the American Street-Railway Association, at his office in Brooklyn, to obtain the latest information concerning the approaching Convention of the Association, which will be held in New York City on Oct. 15th. Mr. Richardson courteously placed all the information in his possession at our disposal and declared that the prospects for a most successful convention were excellent.

"In the Association," he remarked, "there are sixty-one companies enrolled as members, representing fifty per cent. of the corporate wealth invested in street-railways in the country. Our first Convention was held two years ago, at which nearly forty companies were represented. Last year the number was greatly increased and this year I confidently look for an accession of from twenty to forty new companies—new of course in the sense of membership in the Association. This membership is confined to American street-railways or their lessees or individual owners, and each membership carries with it one vote. This definition includes any kind of street-railway, regardless of the motive power employed, and I presume membership would even be permitted to an elevated railway, though none such have yet applied. Since April, I have sent out monthly to all the companies in the United States and Canada, a judicial decision bearing directly upon the interests of street-railways, and I did not confine myself to sending them to those companies alone that are members of the Association. Of course, we are anxious to publish the existence of the Association as widely as possible, and thus increase our membership, so I was very liberal with these legal decisions. They will not be distributed so freely hereafter. The Association is now an assured success, and if street-railways do not wish to join it, I do not think we ought to keep them posted with information, to obtain which we are put to considerable trouble and expense. The expense attending membership is very small, and was purposely made so in order to encourage the poorest company to join. It consists of an admission fee of $25, and yearly dues of $15, payable in advance.

"The topics to be discussed at the Convention," continued Mr. Richardson in response to an inquiry, "will be varied and of vital interest to street-railways. Among them will be the reports of the special committees appointed at the last meeting on the Completed Construction of New Road, Repairs of Track, Track-cleaning and the Removal of Snow and Ice, Stables and the Care of Horses, the Electrical and Cable Systems of Motive Power, a Uniform System of Accounts, Labor and the Graduating System of Compensation, the Ventilating, Lighting and Care of Street-cars and on Taxation and License. Thus you see we endeavor to cover a wide field of usefulness. Possibly there will be papers read on other topics, and discussions thereon, the nature of which we do not know as yet. The Convention will, probably, be held at the Fifth Avenue Hotel, and will last three days. It will be concluded with a banquet, and definite arrangements will be made for the entertainment of the members by the New York City street-railway companies having that department of the Convention in charge. From what I can gather, a number of officers and managers of street-railways will take advantage of this opportunity to visit New York, and we confidently expect a very large attendance."

"The practical results of the Association have been very beneficial," concluded Mr. Richardson, "and the successful continuance of the organization is assured. There is naturally a unanimity of interests among the street-railways of this country with regard to the practical questions which they daily meet and the difficulties with which they have to contend, and a yearly meeting of the various roads for discussing these matters have proved and will continue to prove a powerful incentive to solving the problems of street-railway construction and management. The organization of our Association has been followed by that of

local and State associations which, while independent, are working in harmony for the same ends as ourselves. There is now an Association in Ohio known as the Ohio State Tramway Association, and one in this State organized last year as the Street-Railway Association of the State of New York, which held a very successful convention in New York City on September 2d. With one exception, every street-railway company of New York City is connected with the State Association, and we look for other similar organizations as the outgrowth of the American Association. The October Convention will give the American Association a still greater impetus, and in time we trust to include among its members every street-railway company in the United States and Canada."

Second Annual Convention of the Street-Railway Association of the State of New York.

THE second annual Convention of the Street-Railway Association of the State of New York was held at the Fifth Avenue Hotel in New York City, on Tuesday, September 2d. About fifteen street-railways of this State were represented and the convention was a most successful one. Interesting reports were submitted on the subjects of Motive Power, the Removal of Snow and Ice from Tracks, and the Best Method of Collecting Fares. A lively discussion on the subject of Horse-shoeing was also held. The following officers were elected for the ensuing year: President, Charles Cleminshaw, of the Troy and Lansingburgh Railroad Co., Troy; First vice-president, William H. Hazzard, of the Brooklyn City Railroad Co., Brooklyn; Second vice-president, Patrick Barry, of the Rochester City and Brighton Railroad Co., Rochester; Secretary and Treasurer, William J. Richardson, of the Atlantic Avenue Railroad Co., Brooklyn; Executive Committee, the president, secretary and treasurer, Jacob Sharp, of the Twenty-third Street Railway Co. and the Christopher and Tenth Street Railroad Co., New York, Henry M. Watson, of the Buffalo Street-Railroad Co., Buffalo, and C. Densmore Wyman, of the Central Park, North and East River Railroad Co., New York. Of these officers, Mr. Richardson holds a similar office in the American Street-Railway Association, Mr. Hazzard is president, and Mr. Sharp a member of the executive committee of the same.

At the conclusion of the proceedings the Street-Railway Association of the State of New York, adjourned to meet in Saratoga Springs on Tuesday, September 1st, 1885.

The Electric Tramway at Coney Island.

CONEY ISLAND at present possesses an electric tramway in successful operation on the new iron pier. Though more in the nature of a model than a practical tramway it affords an interesting study for those contemplating the adoption of electricity as the motive power for tramway propulsion.

The road is operated by the Daft system, and extends for 780 feet along the west side of the West Brighton pier. The track is of two feet gauge, the rails being of the T pattern, twenty feet in length, eight pounds to the foot. These are laid on strips of wood, and all firmly bolted to the pier planking. No attempt is made at insulation, none being needed, as on the wettest days the escape of current would be scarcely perceptible. The dynamo is shunt-wound, and capable of furnishing a 6 h. p. current. It is driven by an 8 h. p. vertical engine with boiler to correspond, manufactured by the New York Safety Steam Power Company. The speed of the engine being 250, direct belting was possible.

The motor is of the same model as its predecessor, the *Ampere*, which made the successful trial test at Saratoga. Its name, *Pacinotti*, is equally appropriate. The body is built of two-inch ash, and is six and one-half feet long, by three feet wide. The superstructure is simply a dash-board twenty inches high, to which the switches for controlling the motor are attached, with a box on the rear, within which is placed the receiving dynamo.

Two cars are provided for the transportation of passengers, each twelve feet two inches long and thirty-two inches wide, weighing about 400 pounds, and accommodating twenty persons, ten on each side sitting back to back, making a normal load of forty. As many as fifty people have been carried at one time, a total weight of about four tons. The weight of the *Pacinotti* is about 1,200 pounds, and its maximum speed from eleven to fifteen miles per hour, although this is obviously limited on so short a track.

Austin Corbin and the Brooklyn Bridge.

AUSTIN CORBIN, the Long Island railway magnate, has made an offer to the cities of New York and Brooklyn to lease the right of operating the cable railway on the New York and Brooklyn Bridge. He announces himself as prepared to guarantee a yearly rental of $250,000 for a term of twenty years and will purchase the rolling-stock now in use at a fair valuation and keep the road-bed in good condition. Mr. Corbin makes a further offer to lease the right of controlling and operating the entire business of the bridge for the same term of years at an annual rental of $450,000, contracting on his part that no tolls for passengers or trains shall be in excess of those charged at present. In the event of the latter offer being accepted, the sole expense the cities would be called upon to pay would be for the police service of the bridge.

It is claimed that the bridge has not yielded sufficient revenue up to the present time to meet the expenses of maintenance, and it is thought that Mr. Corbin has seen various improvements that could be introduced in its management, rendering the bridge profitable. The two cities have as yet taken no action on his communication.

TRAMWAY NOTES.

THE Forty-second Street, Manhattanville and St. Nicholas Avenue Railroad Company of this city is still meeting with opposition in the courts, though it is laying its tracks with great celerity.

THE John Stephenson Company of this city is filling an extensive order for tram-cars for use on tramways in Japan, the first from that country, we believe.

IN order to improve and extend its road, the Broadway and Seventh avenue Railroad Company has issued $1,000,000 of bonds.

New Inventions.

The Lawrence Vacuum Brake.

LOUIS P. LAWRENCE, of Passaic, N. J., is the inventor and patentee of a vacuum brake which is herewith illustrated and described. The object of this invention is to produce a cheap, durable and reliable brake at such cost that it may be applied to railway rolling-stock of all descriptions. In the illustrations, Fig. 1 is a front view of the ejector, and Fig. 2 a vertical longitudinal section of the same. Fig. 3 is a top view of the pipe and hose-coupling, and Figs. 4 and 5 are horizontal longitudinal sections of the same uncoupled. Fig. 6 is a vertical longitudinal section of the vacuum-cylinder showing the manner in which the power is transmitted to the brake-levers from the piston C.

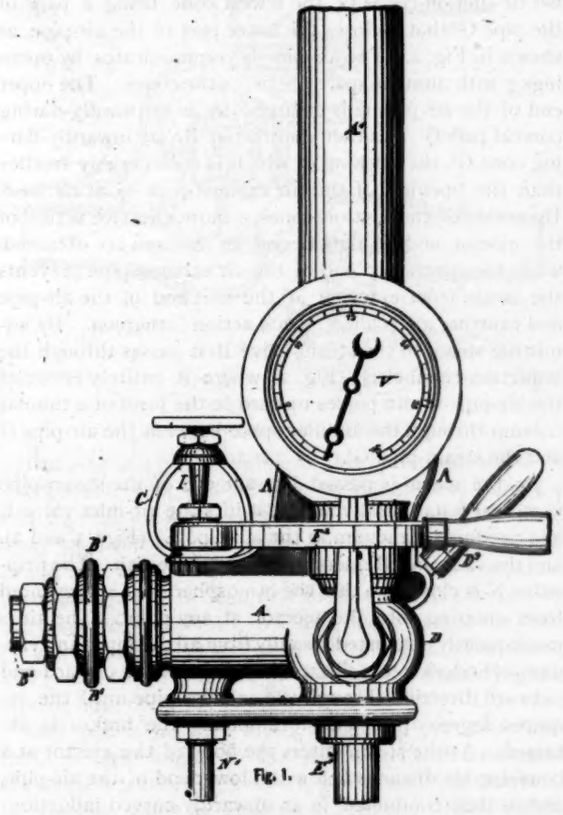


Fig. 1.

THE LAWRENCE VACUUM BRAKE.

The air-ejector (Fig. 1) of this brake has the advantage of creating a high degree of vacuum, and the water of condensation is conducted from all parts of the ejector by its gravity, to the drip-valve and discharge-pipe N at the lower part of the ejector, preventing it from entering the air-passages and exhaust pipe. The body is cast in one piece (Fig. 2) with an interior steam-induction channel, steam-expansion chamber, and air-chamber and channels for conducting the condensations.

An equilibrium-valve is arranged at the rear of the air-chamber below the air-valve, so as to reëstablish the pressure in the brake-cylinder. This equilibrium-valve is held closed by a lever, actuated by a spring. The lever is fulcrumed to the handle of the equilibrium-valve and presses upon its center in such a manner as to keep it closed tightly on its seat as will be shown hereafter. It will be seen that the brakes are applied and released by means of the levers F^2 and D^2, which are located so near each other that they are convenient to operate with one hand if so desired. In the steam supply-pipe B^2 (Fig. 2), is fitted a conical valve b' b', the chamber B′ of which is screwed or

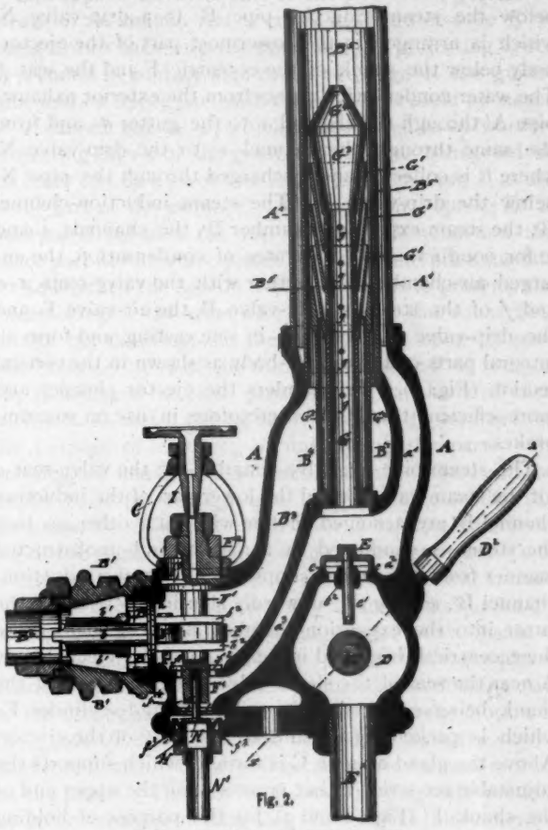


Fig. 2.

THE LAWRENCE VACUUM BRAKE.

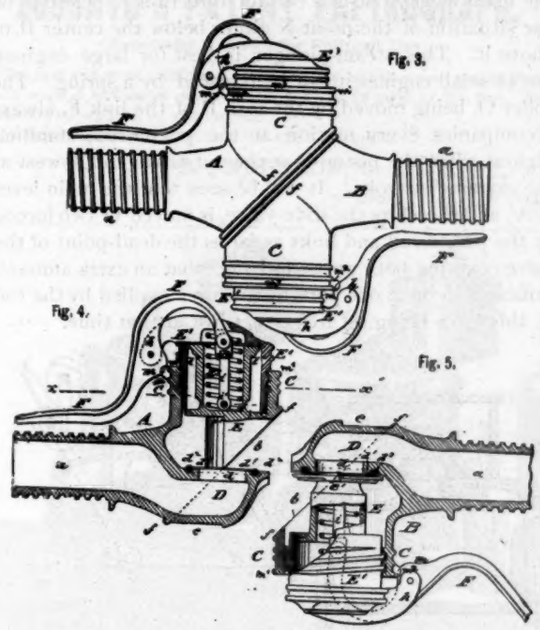
otherwise connected to the lower part of the body A, and also connected by a suitable coupling with the steam supply-pipe B^2. The stem b of the steam-valve B is guided in central bearings b' of the valve-chamber B′, while the inner end of the valve B is provided with a forked extension b^2, carrying an intermediate anti-friction roller b^3. The forked extension b^2 passes alongside of the shank F′, (Fig. 2) over an eccentric F, on the shank, which eccentric bears upon the anti-friction roller b^3, and moves the steam supply-valve B either way from the seat A into open position, or into closed position against the same, according as the shank F′ is turned by a lever, F^2 (Fig. 1), applied to its outer end in one or the other direction. The forked extension b^2 (Fig. 2) prevents the steam supply-valve B from turning on its axis in either direction, and secures the contact of the anti-friction roller b^3 with the face of the eccentric F. The steam-induction channel B^3 extends from the supply-valve B in an upwardly slanting direction to an annular steam-expansion chamber B^4, which is arranged around the air exhaust-pipe G that is screwed into an opening at the bottom of the steam expansion-chamber B^4. To the upper part of the expansion-chamber B^4 is screwed the steam-pipe B^5, and to the

upper end of the ejector-body A the exterior exhaust-pipe A′, which are both arranged concentrically to the air exhaust-pipe G. The annular space formed between the exterior exhaust-pipe A′ and the steam-pipe B^5 is connected by a channel a', extending along the outside of the expansion-chamber B^4 to an annular gutter a^2, arranged around the raised and beveled seat e of the air-valve E. The gutter a^2 is connected by a steam-channel a^3, arranged below the steam induction-pipe B^3 to a drip-valve N, which is arranged at the lowermost part of the ejector-body below the shank of the eccentric F and the seat f. The water condensation passes from the exterior exhaust-pipe A′ through the channel a' to the gutter a^2, and from the same through the channel a^3 to the drip-valve N, where it is collected and discharged through the pipe N′ below the drip-valve N. The steam induction-channel B^3, the steam expansion-chamber B^4, the channels a' and a^2 for conducting off the water of condensation, the enlarged air-chamber D, together with the valve-seats a, e, and f of the steam supply-valve B, the air-valve E, and the drip-valve N, are made in one casting, and form all integral parts of the ejector-body as shown in the vertical section (Fig. 2). This renders the ejector cheaper and more efficient than those heretofore in use on vacuum-brakes.

The steam-pipe B^2, valve-chamber B′, the valve-seat a for the steam-valve B, and the lower part of the induction channel B^3 are arranged in line with each other, so that the steam is conducted in a natural and unobstructed manner from the steam supply-pipe B^2 to the induction-channel B^3, and by the upwardly slanting portion of the latter into the expansion-chamber B^4. The shank F′ of the eccentric F is guided in bearings of the ejector-body A near the seat of the steam-valve, the upper part of the shank being enlarged so as to form a guide-cylinder F_3, which is packed by a gland to the body of the ejector. Above the gland an arch C is formed, which supports the adjustable set-screw I that presses upon the upper end of the shank F′ (Figs. 1 and 2), for the purpose of holding the lower part of the cylinder F^3 tightly on its seat of the body A. The guide-cylinder F^3 is lubricated by means of oil-passages that extend through the set-screw I and cylinder F^3 to the seat of the same on the body A (Figs. 1 and 2). The operating lever handle F^2 (Fig. 1) of the eccentric F is secured to the square exterior end of the shank F′, and retained securely thereon by a screw-nut. The handle F^2 (Fig. 1) is curved and extended across the front part of the ejector toward the right hand end of the same below the vacuum-gauge V (Fig. 1). The shank F′ of the eccentric F is provided at its lower part with a disk f', which rests on a seat at the lower end of the steam-induction channel B^3 of the body A, the seat being provided with recesses at its inner edge. The disk f' has at one point of its circumference a recess f^2, through which the water of condensation collected at the lower part of the steam induction-channel B^3 is drained off into the channel a^3, and thence to the discharge-pipe N′. The stem f^4 of the drip-valve N is guided in a central perforation of the lower end of the shank F′ of the eccentric F. The discharge-pipe N′ is secured to the body of the ejector by a gland H, which is provided with interior projections f^3, that form rests for the drip-valve N when the latter is not drawn up against the seat f at the end of the channel a^3 by the operation of the ejector. The air-valve E is made in an inverted cup shape, and is guided by a stem e' in a central bearing e^2, below its raised seat e (Fig. 2). The convex upper surface of the air-valve E sheds the water of condensation into the gutter a_2 and channel a^3. At the rear of the air-chamber D (Figs. 1 and 2) is arranged an equilibrium-valve D (Fig. 2) through which air is admitted to the different vacuum-cylinders below the cars of the train after they have been exhausted by the ejector whenever the ordinary atmospheric pressure is to be established therein. The equilibrium-valve D is provided with a lever D^2 (Figs. 1 and 2), that is fulcrumed to projecting ears d on the body of the ejector and securely retained in closed position when not in use by means of a locking-lever which is fulcrumed to the lever of the equilibrium-valve D and acted upon by a spiral spring at its rear end, so that its pointed front end is firmly pressed on the concave center portion of the equilibrium-valve D (Fig. 2). The air exhaust-pipe G is arranged with a number of suction-cones G′, the lowest cone being a part of the pipe G^2 that incloses the lower part of the air-pipe, as shown in Fig. 2. The air-pipe G communicates by openings g with annular spaces between the cones. The upper end of the air-pipe G is enlarged by an outwardly-flaring conical part G^3, and then contracted by an inwardly-flaring cone G^4, the opening of which is considerably smaller than the opening of the air exhaust-pipe G at its base. By means of the suction-cones, a more effective action of the ejector and a high degree of vacuum are obtained, while the contracted end of the air exhaust-pipe prevents the steam from entering at the exit end of the air-pipe and exerting a so-called "back action" thereon. By admitting steam to the steam-valve B, it passes through the induction-channel B^3 (Fig. 2), where it entirely encircles the air-pipe G and passes upward in the form of a tubular column through the annular space between the air-pipe G and the steam-pipe G′.

As the steam is passed into the end of the steam-pipe G at nearly its initial velocity, it lifts the air-inlet valve E and produces a vacuum in the air-pipe E′ (Figs. 1 and 2), and the vacuum cylinders connected therewith. The drip-valve N is closed, so that the atmospheric air is prevented from entering into the ejector at any point. The air is consequently exhausted steadily from all the pipes and vacuum-cylinders to the ejector, and drawn in an upward and outward direction through the exhaust-pipe until the required degree of vacuum for applying the brakes is obtained. As the steam enters the body of the ejector at a considerable distance below the lower end of the air-pipe, and is then conducted in an upwardly-curved induction-channel into the expansion-chamber, where it obtains a direction parallel to the air-pipe, it encircles the air-pipe entirely, and passes in an unbroken column through the annular space between the air-pipe and the steam-pipe, so as to exert its full effect in the most natural manner, and produce almost instantly a very high degree of evacuation in the vacuum-cylinders and a quick and effective application of the brakes. When the brakes are to be released, the steam-valve is closed by the handle of the eccentric, and the equilibrium-valve D opened by pressing the lever D^2 (Figs. 1 and 2) and the atmospheric pressure is re-established in the entire brake system. The drip-valve N is dropped in the seats of its gland, and the water of condensation falls by its own gravity and is conducted off through the discharge-pipe N′. No part of the water of

condensation can be carried along by the air when the ejector is exhausting, owing to the raised seat of the air-valve and to the shape of the channels that conduct it downward to the drip-valve at the lowermost part of the ejector. By this simple arrangement the water of condensation is drained off at each operation of the ejector so that it can neither accumulate in the interior of the ejector-body nor be carried off through the exhaust-pipe, so as to soil the adjoining parts of the locomotive.



THE LAWRENCE VACUUM BRAKE.

The pipe and hose-coupling of this brake embrace some novel features as will be seen by reference to Figs. 3, 4 and 5. Fig. 3 is a top view of the device when coupled, and Figs. 4 and 5 are horizontal sections shown uncoupled. A and B in the several figures represent the two separate parts, and it will be seen that the coupling is effected by bringing the parts shown in Figs. 4 and 5 so that the lines *f f* and *f f* are in contact as shown in Fig. 3. The shank *a* of each section is ribbed or threaded for connecting the pipe or hose thereto.

Each part is provided with a cylindrical portion or barrel C, at right angles to the shank, and with a flattened jaw-shaped portion D, between which and the barrel C an angular recess or opening *b* is formed. The shank, barrel, and jaw are made in one casting of the required size and strength. The jaw-shaped portion D communicates, by a circular opening *d*, with the shank *a* of each part, and is surrounded by a valve-seat *d'*, and by an elastic washer d^2, set into a circular groove, against which a guided spring-actuated valve-piston E is forced. The valve-piston E is guided in a cylindrical tube E′ at the inside of the barrel C of each part of the coupling, this guide-tube being connected adjustably to the barrel C by means of a screw-thread. The underside of each jaw has a transverse notch or recess *e*, which interlocks with a corresponding transverse projection *e'*, at the underside of the piston E when the jaw is inserted into the space provided at the interior of the same in the interlocking part of the coupling. A diagonal rim *f* extends around the jaw and the edge of the angular opening *b* of each part, and forms a contact-stop when the parts are coupled together. The valve-piston E is guided in the cylindrical barrel C of each part by means of projections *g* of the valve portion, which enter into corresponding grooves *g'* of the barrel, for the purpose of preventing any axial motion of the piston.

The upper cylindrical part of the piston E is guided by means of an annular rim or collar in the guide-tube E′, it being drawn back into the same until its projecting lower part comes in contact with the lower edge of the guide-tube and its upper part with the top of the same by means of a curved handle F, which is fulcrumed to outwardly-projecting lugs *h* of the guide-tube E′, and connected at its inner end by a pivot-link *i*, to a transverse pin *i'*, at the lower part of the piston E. A strong spiral spring E^2 is interposed between the top of the guide-tube and the lower part of the valve-piston, and serves to press the latter down when the handle is released, so as to produce the interlocking of the same with the jaw of the connecting part of the coupling, and the tight closing upon its seat. The outermost end of the fulcrumed handle F of the piston is arranged in close proximity to the shank of each part A B, so that it can be easily grasped by the hand for the purpose of coupling or uncoupling the parts. By pressing the handle toward the shank the piston will be drawn back far enough into its guide-tube so that the parts may be separated. Whenever a reliable interlocking of the parts, or a tight closing of the piston to its seat is desired, the guide-tube E′ of the piston is turned axially in the barrel of each part by means of its handle, by which motion interior projecting lugs *l* at the inside of the guide-tube engage the lower part of the valve-piston E and force the tighter on the recessed interlocking jaw of the other part of the coupling the more the motion of the guide-tube is continued around its axis, the screw-connection with the barrel C securing the forward motion of the piston. The handle F bears during this motion, by an inwardly-projecting lug *m*, near its fulcrum, on a rim *m'*, of the cylindrical barrel C of each part, so as to prevent the rattling of the handle. When the handle is brought back again to its former position in line with the shank, the projection *m* is in contact with a projecting lug m^2. When, however, the valve-piston E is to be locked to its seat, the lugs *l* of the guide-tube E′ pass up through notches l^2 of an annular rim *l'*, at the upper end of the tubular part of the valve-piston and press, on turning the handle and guide-tube, down upon the collar, so as to force the lower part of the piston tightly down on its seat. When the handle is returned against the notch m^2 the interior lugs *l* are in line with the notches l^2 of the collar, and then admit the forward motion of the piston by the spring or the drawing back of the same by the handle. By taking hold of both parts and handles and drawing back both pistons, the jaws can be inserted into the interior spaces of each part, so that a reliable coupling of the parts is obtained on releasing the handles. By giving to the guide-tubes of the pistons, by means of the handles, an axial turn, the pistons are rigidly and reliably locked to the jaws, and thereby prevent any possibility of detaching the parts. By returning the handles into line with the shanks and lifting the piston sufficiently so that the interlocking shoulders at the under sides of their jaws clear each other, the parts of the coupling can be un-

coupled quickly and with great facility. By the rapidity with which the coupling and uncoupling can be accomplished, as well as by the reliable and intimate interlocking of the parts, the coupling is specially adapted for the air and steam-pipes of railway cars, for fire-hose, and for applications of a similar nature.

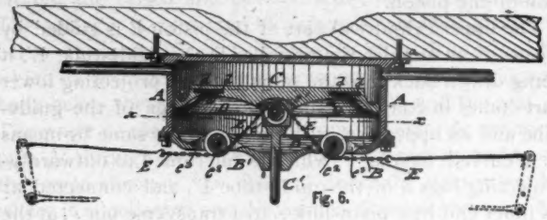


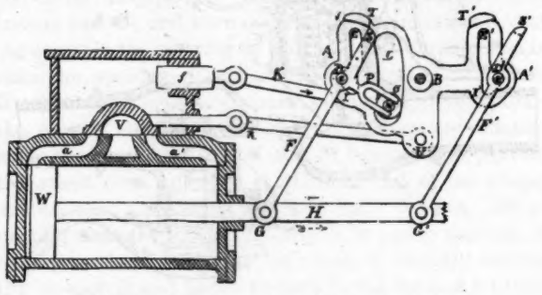
Fig. 6.

THE LAWRENCE VACUUM BRAKE.

Fig. 6 represents the vacuum-cylinder of the Lawrence brake. The head of the cylinder is attached to the bottom of the car-frame by bolts *a a*. The head and side walls are cast integral. The vacuum-cylinder A A is closed at its lower end by a bottom B, that is rigidly secured to the cylinder A. A piston C, is tightly fitted by a ring-shaped rubber packing D, to the interior of the cylinder, the packing D being attached by flanges *d d* into a circular recess *d'*, at the under side of the piston C. The outer circumference of the piston C is made of downwardly-flaring shape, against which bears the packing-ring D. The packing-ring D is sprung by its flanges *d d* into the recess *d'* of the piston, and is detained rigidly thereby without riveting or any other means of attachment. It may, therefore, be readily replaced at any time when worn out by use. The vacuum-cylinder A is connected to the air-ejector of the locomotive by connecting-pipes and intermediate pipe-couplings in the usual manner. When a vacuum is established in the cylinder A, the piston C is lifted by the pressure of the atmosphere. The packing-ring D is thus sucked tightly around the edge of the piston and against the side wall of the cylinder, so that the admission of atmospheric air is entirely prevented, and a high degree of vacuum is established in the cylinder. As soon as the vacuum is discontinued and atmospheric pressure established at both sides of the piston, the same glides downward easily without interference by the packing D. The piston C is provided with a central downwardly-extending stem C', which is guided in a central perforation of the bottom B. A diametrical recess *e'* is arranged in a central hub of the piston C, the recess being of sufficient width to admit a guide-roller *e*. Equidistant from the stem C' the cylinder-bottom B is provided with guide-rollers e^2, which are arranged in slots of a diametrical reinforcement of the bottom, and in line with the recess *e'* of the piston-hub. The chain E, which connects the brake-levers of the car-trucks, is passed from one brake-lever over one guide-roller *e*, of the piston, then over the second e^2, and the opposite brake-lever, as shown at E E. On establishing the vacuum in the cylinder A, the brake-levers are actuated and the brake-shoes applied to the car-wheels. As soon as the vacuum is discontinued the piston is lowered by its own gravity and that of other parts connected therewith, and the brakes are released without the use of springs. In this manner a very effective vacuum-cylinder for railway car-brakes is obtained, which is simple in construction, and quick and effective in operation.

Windhurst's Valve-gear for Steam-pumps.

THE cut below illustrates a valve-gear for steam-pumps invented and patented by Lewis Windhurst, of Springfield, Ohio. P is a forked branch of a link F, serving to move up or down the roller O, on the pin N, in the wide slide or arc L. This roller and pin form the end of a pushing rod K, which is here shown as pushed by a steam-plunger making pressure at the point N, always tending to turn the main lever A A' in a certain direction depending on the situation of the point N either below the center B, or above it. This steam-plunger is best for large engines, but in small engines it can be replaced by a spring. The roller O, being moved by the fork P of the link F, always accompanies every motion at the piston-rod, standing highest when the piston is at the outstroke and lowest at the extreme instroke. It will be seen that the main lever A A', and therefore the slide-valve, is moved by two forces: by the piston-rod and links as far as the dead-point of the valve covering both ports, and after that an extra amount, sufficient to open one port, by the force applied by the rod K, this force being set free to act just at that time.



WINDHURST'S VALVE-GEAR FOR STEAM-PUMPS.

In the illustration the piston-rod and all parts connected therewith are almost at the extreme instroke and the rocking-lever A A' is in a position corresponding to the dead-point of the valve. The acting points or pins *e e* of the links F F' resting in the corners D D' of the slits E D and E' D', and the upper part S, of the link F is just ready to escape from under T, these parts acting as a time-lock, setting free the power of the roller O, exerted on the rocking-lever A A', and readily corrected by setting T in its proper place to take up wear. The slightest inward motion of the piston-rod indicated by the upper arrow at H will disengage the end S from under T, upon which the rod K is free to act, forcing down the arm A a little more than shown, and opening the port *a*. At the same time the arm A' would rise a little, moving the corner I' against the pin *e'* of link F', etc.

It is claimed by the inventor that this valve-motion will do away with auxiliary steam piston-valves, moving the slide-valve similar to an eccentric, causing a gradual opening and closing of the ports with a minimum friction; that it avoids the wear of small surfaces exposed to great pressure and admits of their adjustment, and that it has no dead-points whatever. The device is inexpensive, requires no close fitting and admits of easy alteration and regulation, as all ports are outside in plain view.

IT is stated that a Canadian invention for lighting cars by electricity, the power being taken from the car axles, has been tried successfully upon the Grand Trunk Railway.